

EMISSIONS TESTING REPORT 10843
Text and Appendices

PERFORMED FOR:

COVANTA ENERGY GROUP, INC.
Morristown, New Jersey

at the

HUNTINGTON RESOURCE RECOVERY FACILITY
HUNTINGTON, NEW YORK

Units 1, 2, and 3 SDA Inlets and FF Outlets

September 2012

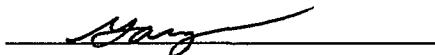
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REPORT CERTIFICATION 10843

I hereby certify that I have personally examined and am familiar with the information submitted herein. Based upon my own knowledge and my inquiry of those individuals responsible for obtaining the information presented, the foregoing information is true, accurate and complete. I am aware that this information is being requested for the purpose of determining compliance with local, state, and federal laws and may be submitted to appropriate governmental regulatory agencies for those purposes. I am aware that there are significant penalties for submitting false information to such agencies, including the possibility of fine and imprisonment.

Signature



Date:

10/16/12

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1.0 INTRODUCTION

1.1 General

Covanta Energy Group, Inc. (Covanta) operates the Huntington Resource Recovery Facility in East Northport, New York. Covanta contracted TESTAR, Inc. to conduct an air emissions testing program to quantify specific emissions from Units 1, 2, and 3 for compliance purposes. The testing program was conducted between August 28 and September 07, 2012 by TESTAR under the supervision of Mr. Dan Miesse of Covanta Energy Group, Inc.

1.2 Test Personnel

Table 1-1 presents the personnel that were involved in the testing program.

**Table 1-1
Test Personnel**

Affiliation	Personnel Responsibility
Covanta Energy Group, Inc.	Rick Kohler Test Coordinator
	Dan Miesse Test Coordinator
Covanta of Huntington	Scott Wheeler Test Coordinator
New York State Dept. of Environmental Conservation	Gary E. Zimmerman Test Observer
TESTAR, Inc.	David Brintle Project Director
	Gary Williams, PE, QSTI Project Director
	Chris Wrenn CEM Test Engineer
	Blake Cone Field Laboratory Manager
	Charles Nahrebecki Test Engineer
	Sean Daley Test Engineer
	Jeff Aims Field Laboratory Manager
	Will Snipes Test Engineer
	Tom McDonald Test Engineer

1.3 Test Parameters and Run Numbers

Tables 1-2, 1-3, and 1-4 present the test dates, sampling locations, flue gas parameters, sampling methods, and run numbers for reference for Unit 1, 2, and 3, respectively.

**Table 1-2
Unit 1 Test Sequence**

Test Location	Sampling Method	Flue Gas Parameter	Run Date	Run Time	Run Number
Unit 1 SDA Inlet	EPA M26A	Hydrogen Chloride	09/05/12	0851-1000	1-I-M26-1
			09/05/12	1121-1228	1-I-M26-2
			09/05/12	1346-1452	1-I-M26-3
	EPA 29	Mercury	09/05/12	0820-1033	1-I-M29-1
			09/05/12	1050-1259	1-I-M29-2
			09/05/12	1315-1524	1-I-M29-3
Unit 1 FF Outlet	EPA M26A	Ammonia, HCl, and HF	09/05/12	0851-1000	1-O-M26A-1
			09/05/12	1121-1228	1-O-M26A-2
			09/05/12	1346-1452	1-O-M26A-3
	EPA Method 316	Formaldehyde	08/28/12	1019-1123	1-O-M316-1
			08/28/12	1315-1420	1-O-M316-2
			08/28/12	1609-1712	1-O-M316-3
	EPA 29	Particulate and Metals	09/05/12	0820-1033	1-O-M29-1
			09/05/12	1050-1259	1-O-M29-2
			09/05/12	1315-1524	1-O-M29-3
	EPA 201A	PM10	08/30/12	0802-1013	1-O-M201A-1
			08/30/12	1106-1313	1-O-M201A-2
			08/30/12	1408-1612	1-O-M201A-3
	EPA 8	Sulfuric Acid Mist	08/28/12	0900-1003	1-O-M8-1
			08/28/12	1144-1248	1-O-M8-2
			08/28/12	1445-1547	1-O-M8-3
	EPA 25A	THC as Ethane	08/28/12	0900-1039	1-O-CEM-1,2,3
			08/28/12	1051-1229	1-O-CEM-4,5,6
			08/28/12	1243-1419	1-O-CEM-7,8,9
	Facility COMS	Opacity	09/05/12	0900-1000	1-O-COMS-1
			09/05/12	1100-1200	1-O-COMS-2
			09/05/12	1400-1500	1-O-COMS-3
Ash Handling System	EPA 22	Fugitive Emissions	08/30/12	0815-0925	M22-1
			09/06/12	0820-0930	M22-2
			09/06/12	0940-1050	M22-3

**Table 1-3
Unit 2 Test Sequence**

Test Location	Sampling Method	Flue Gas Parameter	Run Date	Run Time	Run Number
Unit 2 SDA Inlet	EPA M26A	Hydrogen Chloride	09/06/12	0845-0956	2-I-M26-1
			09/06/12	1114-1223	2-I-M26-2
			09/06/12	1342-1450	2-I-M26-3
	EPA M29	Mercury	09/06/12	0814-1024	2-I-M29-1
			09/06/12	1043-1257	2-I-M29-2
			09/06/12	1311-1521	2-I-M29-3
Unit 2 FF Outlet	EPA M26A	Ammonia, HCl, and HF	09/06/12	0845-0956	2-O-M26A-1
			09/06/12	1114-1223	2-O-M26A-2
			09/06/12	1342-1450	2-O-M26A-3
	EPA M23	Dioxins/Furans, PAHs, and PCBs	08/28/12	1333-1814	2-O-M23-1
			08/30/12	0756-1159	2-O-M23-2
			08/30/12	1205-1610	2-O-M23-3
	EPA Method 316	Formaldehyde	08/29/12	0923-1025	2-O-M316-1
			08/29/12	1209-1313	2-O-M316-2
			08/29/12	1503-1607	2-O-M316-3
	EPA M29	Particulate and Metals	09/06/12	0814-1024	2-O-M29-1
			09/06/12	1043-1257	2-O-M29-2
			09/06/12	1311-1521	2-O-M29-3
	EPA M201A	PM10	08/28/12	0904-1113	2-O-M201A-1
			08/28/12	1210-1410	2-O-M201A-2
			08/28/12	1506-1717	2-O-M201A-3
	EPA M8	Sulfuric Acid Mist	08/29/12	0800-0904	2-O-M8-1
			08/29/12	1038-1142	2-O-M8-2
			08/29/12	1328-1438	2-O-M8-3
	EPA M25A	THC as Ethane	08/29/12	0805-0940	2-O-CEM-1,2,3
			08/29/12	0952-1136	2-O-CEM-4,5,6
			08/29/12	1147-1455	2-O-CEM-7,8,9
	Facility COMS	Opacity	09/06/12	0900-1000	2-O-COMS-1
			09/06/12	1100-1200	2-O-COMS-2
			09/06/12	1400-1500	2-O-COMS-3

**Table 1-4
Unit 3 Test Sequence**

Test Location	Sampling Method	Flue Gas Parameter	Run Date	Run Time	Run Number
Unit 3 SDA Inlet	EPA M26A	Hydrogen Chloride	09/07/12	0844-0955	3-I-M26-1
			09/07/12	1112-1221	3-I-M26-2
			09/07/12	1403-1513	3-I-M26-3
	EPA M29	Mercury	09/07/12	0813-1024	3-I-M29-1
			09/07/12	1041-1314	3-I-M29-2
			09/07/12	1331-1542	3-I-M29-3
Unit 3 FF Outlet	EPA M26A	Ammonia, HCl, and HF	09/07/12	0844-0955	3-O-M26A-1
			09/07/12	1112-1221	3-O-M26A-2
			09/07/12	1403-1513	3-O-M26A-3
	EPA Method 316	Formaldehyde	08/30/12	0930-1033	3-O-M316-1
			08/30/12	1220-1324	3-O-M316-2
			08/30/12	1521-1625	3-O-M316-3
	EPA M29	Particulate and Metals	09/07/12	0813-1024	3-O-M29-1
			09/07/12	1041-1314	3-O-M29-2
			09/07/12	1331-1542	3-O-M29-3
	EPA M201A	PM10	08/29/12	0800-0957	3-O-M201A-1
			08/29/12	1043-1250	3-O-M201A-2
			08/29/12	1340-1549	3-O-M201A-3
	EPA M8	Sulfuric Acid Mist	08/30/12	0810-0914	3-O-M8-1
			08/30/12	1054-1158	3-O-M8-2
			08/30/12	1350-1454	3-O-M8-3
	EPA M25A	THC as Ethane	08/30/12	0808-0953	3-O-CEM-1
			08/30/12	1004-1152	3-O-CEM-2
			08/30/12	1220-1414	3-O-CEM-3
	Facility COMS	Opacity	09/07/12	0900-1000	3-O-COMS-1
			09/07/12	1100-1200	3-O-COMS-2
			09/07/12	1400-1500	3-O-COMS-3

**Table 1-5
Utilization of EPA Method 2 and 3 Data**

Runs Requiring Additional Information	Runs Providing Air Flow Rate Data	Runs Providing Flue Gas Composition Data
1-I-M26-1	NA	1-I-M29-1
1-I-M26-2	NA	1-I-M29-2
1-I-M26-3	NA	1-I-M29-3
1-O-M26A-1	NA	1-O-M29-1
1-O-M26A-2	NA	1-O-M29-2
1-O-M26A-3	NA	1-O-M29-3
1-O-CEM-1,2,3	1-O-M8-1, 1-O-M8-1, 1-O-M316-1	NA
1-O-CEM-4,5,6	1-O-M316-1, 1-O-M8-2, 1-O-M8-2	NA
1-O-CEM-7,8,9	1-O-M8-2, 1-O-M316-2, 1-O-M316-2	NA
2-I-M26-1	NA	2-I-M29-1
2-I-M26-2	NA	2-I-M29-2
2-I-M26-3	NA	2-I-M29-3
2-O-M26A-1	NA	2-O-M29-1
2-O-M26A-2	NA	2-O-M29-2
2-O-M26A-3	NA	2-O-M29-3
2-O-CEM-1,2,3	2-O-M8-1, 2-O-M8-1, 2-O-M316-1	NA
2-O-CEM-4,5,6	2-O-M316-1, 2-O-M8-2, 2-O-M8-2	NA
2-O-CEM-7,8,9	2-O-M316-2, 2-O-M8-3, 2-O-M8-2	NA
3-I-M26-1	NA	3-I-M29-1
3-I-M26-2	NA	3-I-M29-2
3-I-M26-3	NA	3-I-M29-3
3-O-M26A-1	NA	3-O-M29-1
3-O-M26A-2	NA	3-O-M29-2
3-O-M26A-3	NA	3-O-M29-3
3-O-CEM-1,2,3	3-O-M8-1, 3-O-M8-1, 3-O-M316-1	NA
3-O-CEM-4,5,6	3-O-M316-1, 3-O-M8-2, 3-O-M8-2	NA
3-O-CEM-7,8,9	3-O-M316-2, 3-O-M316-2, 3-O-M8-3	NA

2.0 SUMMARY OF RESULTS

2.1 Report Organization

The results of the testing project are summarized in Section 2. The process tested is discussed in Section 3. The sampling and analytical methods utilized are discussed in Section 4 while the Quality Assurance/Quality Control results are presented in Section 5. Appendix A contains detailed results of the testing program. Appendix B contains the field data that was collected and Appendix C contains the analytical results. Appendix D contains all pertinent testing equipment calibration data. Refer to the Table of Contents and the List of Tables and Figures for a complete reference with appropriate page numbers.

2.2 Presentation of Results

Table 2-1 presents the results of the emissions testing project for Unit 1 while Table 2-2 presents the results of the emissions testing project for Unit 2 and Table 2-3 presents the results of the emissions testing project for Unit 3. A more detailed summary of the sampling gas parameters is presented in Appendix A.

2.3 Facility COM Data

Continuous Opacity Monitoring (COM) data for opacity was provided by the facility as per 40CFR 60.11 (e) (5). This data is contained in Appendix B.

2.4 Fugitive Emissions Results

Fugitive emissions measurements were taken along the ash discharge system and at the ash loading area. No periods of visible fugitive emissions were observed during the observation period. The field data sheets are located in Appendix B.

2.5 Carbon Monoxide, Sulfur Dioxide, and Nitrogen Oxides

Carbon monoxide, sulfur dioxide, and nitrogen oxides data (provided by the facility CEMs) was used along with the concurrent EPA Method 29 air flow rates to calculate the three one-hour pounds/hour averages.

2.6 Dioxins/Furans Results and EMPC Values

In accordance with EPA Method 23, Section 9.9, all dioxins/furans results that were below the minimum detection limit (ND) were treated as zero when averaging or totaling the results. All

dioxins/furans results that were an estimated maximum possible concentration (EMPC) are presented using the EMPC value as a positive catch when calculating the results.

2.7 Metals Results

The metals results are presented using a worst case scenario. All non-detected values were considered as positive catches when totaling the analytical fractions. Any result that includes a non-detected value includes a "<" symbol in front of the result. Additionally, the results were not corrected for the blank values that were detected in the reagent blank.

2.8 Duplicate Analyses

Runs 1-O-M29-2, 2-O-M29-2, and 3-O-M29-2 were analyzed in duplicate for metals. All samples for mercury were analyzed in duplicate. All samples for hydrogen chloride were analyzed in duplicate. The average of the duplicate analyses were used for reporting purposes.

2.9 PCB Results

All PCB results that were below the minimum detection limit (ND) or were an estimated maximum possible concentration (EMPC, ~) were treated as positive catches when averaging or totaling the results.

2.10 PAH Results

Certain PAHS, naphthalene and some naphthalene analogs (acenaphthene and 2-methylnaphthalene) are artifacts of the XAD-2 resin manufacturing process. The difficulties in completely removing these PAHs from the XAD-2 resin and further potential artifact production during the analytical procedures preclude reliable PAH results. Therefore, results presented in this report do not include the contribution from naphthalene and its derivatives (acenaphthene and 2-methylnaphthalene). A complete data set can be found in Appendix A.

All PAH results that were below the minimum detection limit (ND) were treated as positive catches when averaging or totaling the results.

**Table 2-1
Unit 1 Summary of Emissions**

Parameter	Rep. 1	Rep. 2	Rep. 3	Average	Permit Limits
Fugitive Emissions					
Fugitive Emissions, % of time	0.0	0.0	0.0	0.0	5%
Unit 1 SDA Inlet Concentrations					
Hydrogen Chloride, ppm @ 7% O ₂	820	609	542	657	NA
Mercury, ug/DSCM @ 7% O ₂	< 77.1	< 45.1	< 54.7	< 59.0	NA
Unit 1 FF Outlet Concentrations					
Ammonia, ppm @ 7% O ₂	3.88	2.90	3.44	3.40	50
Carbon Monoxide, ppm @ 7% O ₂ ¹	11	---	---	11	100
Formaldehyde, ng/DSCM @ 7% O ₂	8.66E+04	5.36E+04	5.12E+04	6.38E+04	1.03E+05
Hydrogen Chloride, ppm @ 7% O ₂	1.51	2.27	1.77	1.85	29 ⁵
Mercury, ug/DSCM @ 7% O ₂	< 1.50	< 1.30	< 1.32	< 1.38	28 ⁵
Metals					
Cadmium, ug/DSCM @ 7% O ₂	0.206	< 0.145	0.308	< 0.219	35
Lead, ug/DSCM @ 7% O ₂	2.76	1.57	4.81	3.05	400
Nitrogen Oxides, ppm @ 7% O ₂ ²	116	---	---	116	185
Opacity, % ³	0.0	0.0	0.0	0.0	10%
Particulate, Gr/DSCF @ 7% O ₂	0.000384	0.000285	0.000244	0.000304	0.010
Particulate, mg/DSCM @ 7% O ₂	0.879	0.652	0.557	0.696	25
PM10, Gr/DSCF @ 7% O ₂	0.000000	0.000107	0.000272	0.000126	0.010
Sulfur Dioxide, ppm @ 7% O ₂ ⁴	1	---	---	1	29 ⁵

¹ – 4 hour block average (from Facility CEMs)

² – 24 hour arithmetic average (from Facility CEMs)

³ – COMs readings were used to demonstrate compliance with the opacity standard in lieu of EPA Method 9 as per 40CFR60.11(e)(5) (from Facility COMs)

⁴ – 24 hour geometric average (from Facility CEMs)

⁵ – Permit limits for hydrogen chloride, mercury, and sulfur dioxide are based on concentration or removal efficiency, whichever is less stringent.

**Table 2-1
Unit 1 Summary of Emissions
(continued)**

Parameter	Rep. 1	Rep. 2	Rep. 3	Average	Permit Limits
Unit 1 FF Outlet Emission Rates, lbs/hr					
Carbon Monoxide ¹	2.0	1.8	1.6	1.8	15.9
Hydrogen Chloride	0.319	0.456	0.348	0.374	10.3
Hydrogen Fluoride	< 0.0182	< 0.0186	< 0.0178	< 0.0182	0.73
Mercury	<2.04E-04	<1.68E-04	<1.75E-04	<1.82E-04	0.05
Metals					
Arsenic	<1.84E-05	<1.87E-05	<1.84E-05	<1.85E-05	1.2E-03
Beryllium	<4.59E-06	<4.67E-06	<4.61E-06	<4.62E-06	0.0002
Cadmium	2.79E-05	<1.87E-05	4.07E-05	<2.91E-05	1.5E-03
Chromium	3.33E-04	3.45E-04	2.57E-04	3.12E-04	1.2E-03
Lead	3.75E-04	2.03E-04	6.37E-04	4.05E-04	0.28
Manganese	3.65E-04	3.56E-04	4.61E-04	3.94E-04	8.6E-03
Nickel	6.55E-04	8.41E-04	5.75E-04	6.90E-04	8.2E-04
Vanadium	<1.84E-05	<1.87E-05	<1.84E-05	<1.85E-05	2.0E-04
Zinc	2.37E-03	1.61E-03	2.42E-03	2.13E-03	8.6E-02
Total Hydrocarbons (VOC), as ethane ²	0.0416	0.0872	0.0958	0.0749	6.4
Nitrogen Oxides ¹	30.6	29.1	30.2	29.9	NA
Sulfur Dioxide ¹	0.0	0.0	0.0	0.0	32.6
Sulfuric Acid Mist	< 0.0230	< 0.0170	< 0.0233	< 0.0211	2.04
Unit 1 Removal Efficiency %					
HCl, ppm @ 7% O ₂	99.8	99.6	99.7	99.7	>95% ³
Mercury, ug/DSCM @ 7% O ₂	98.1	97.1	97.6	97.6	>85% ³
SO ₂ , ppm @ 7% O ₂ ⁴	100	---	---	100	>75% ³

¹ – Three one-hour averages calculated from Facility CEMs ppmvd and EPA Method 29 air flow rates

² – Three 24-minute test runs were combined to represent one 72-minute VOC test run.

³ – Permit limits for hydrogen chloride, mercury, and sulfur dioxide are based on concentration or removal efficiency, whichever is less stringent.

⁴ – 24 hour geometric average (from Facility CEMs)

**Table 2-2
Unit 2 Summary of Emissions**

Parameter	Rep. 1	Rep. 2	Rep. 3	Average	Permit Limits
Unit 2 SDA Inlet Concentrations					
Hydrogen Chloride, ppm @ 7% O ₂	612	484	1117	738	NA
Mercury, ug/DSCM @ 7% O ₂	< 64.7	< 49.4	< 66.7	< 60.3	NA
Unit 2 FF Outlet Concentrations					
Ammonia, ppm @ 7% O ₂	8.67	16.9	8.92	11.5	50
Carbon Monoxide, ppm @ 7% O ₂ ¹	12	---	---	12	100
2,3,7,8-TCDD, ng/DSCM @ 7% O ₂ (NYTEQ)	0.0107	0.00705	0.0223	0.0134	0.61
Dioxins/Furans, ng/DSCM @ 7% O ₂	0.532	0.360	1.27	0.722	30
Formaldehyde, ng/DSCM @ 7% O ₂	3.60E+04	<1.47E+04	3.16E+04	<2.74E+04	1.03E+05
Hydrogen Chloride, ppm @ 7% O ₂	1.69	1.17	1.71	1.52	29 ^b
Mercury, ug/DSCM @ 7% O ₂	< 1.36	< 1.38	< 1.44	< 1.39	28 ^b
Metals					
Cadmium, ug/DSCM @ 7% O ₂	< 0.151	0.260	< 0.160	< 0.190	35
Lead, ug/DSCM @ 7% O ₂	2.43	11.3	1.40	5.04	400
Nitrogen Oxides, ppm @ 7% O ₂ ²	114	---	---	114	185
Opacity, % ³	0.3	0.3	0.4	0.3	10%
Particulate, Gr/DSCF @ 7% O ₂	0.0000331	0.000403	0.000209	0.000215	0.010
Particulate, mg/DSCM @ 7% O ₂	0.0757	0.922	0.479	0.492	25
PAHs, ng/DSCM @ 7% O ₂	<6.38E+01	<1.19E+02	<1.05E+02	<9.62E+01	8.77E+03
PCBs, ng/DSCM @ 7% O ₂	<2.47E+01	<6.64E+00	<1.88E+01	<1.67E+01	3.88E+03
PM10, Gr/DSCF @ 7% O ₂	0.000505	0.000160	0.000283	0.000316	0.010
Sulfur Dioxide, ppm @ 7% O ₂ ⁴	1	---	---	1	29 ^b

¹ – 4 hour block average (from Facility CEMs)

² – 24 hour arithmetic average (from Facility CEMs)

³ – COMs readings were used to demonstrate compliance with the opacity standard in lieu of EPA Method 9 as per 40CFR60.11(e)(5) (from Facility COMs)

⁴ – 24 hour geometric average (from Facility CEMs)

⁵ – Permit limits for hydrogen chloride, mercury, and sulfur dioxide are based on concentration or removal efficiency, whichever is less stringent.

**Table 2-2
Unit 2 Summary of Emissions
(continued)**

Parameter	Rep. 1	Rep. 2	Rep. 3	Average	Permit Limits
Unit 2 FF Outlet Emission Rates, lbs/hr					
Carbon Monoxide ¹	2.1	1.4	1.2	1.6	15.9
Hydrogen Chloride	0.326	0.219	0.303	0.282	10.3
Hydrogen Fluoride	< 0.0177	< 0.0176	< 0.0178	< 0.0177	0.73
Mercury	<1.64E-04	<1.66E-04	<1.66E-04	<1.66E-04	0.05
Metals					
Arsenic	<1.82E-05	<1.85E-05	<1.85E-05	<1.84E-05	1.2E-03
Beryllium	<4.56E-06	<4.62E-06	<4.62E-06	<4.60E-06	0.0002
Cadmium	<1.82E-05	3.13E-05	<1.85E-05	<2.27E-05	1.5E-03
Chromium	2.63E-04	2.35E-04	2.49E-04	2.49E-04	1.2E-03
Lead	2.93E-04	1.36E-03	1.62E-04	6.04E-04	0.28
Manganese	3.01E-04	2.82E-04	2.54E-04	2.79E-04	8.6E-03
Nickel	4.35E-04	5.84E-04	3.01E-04	4.40E-04	8.2E-04
Vanadium	<1.82E-05	<1.85E-05	<1.85E-05	<1.84E-05	2.0E-04
Zinc	2.21E-03	3.87E-03	2.79E-03	2.96E-03	8.6E-02
Total Hydrocarbons (VOC), as ethane ²	0.0565	0.0542	0.0604	0.0571	6.4
Nitrogen Oxides ¹	26.6	26.3	27.5	26.8	NA
Sulfur Dioxide ¹	0.0	0.0	0.0	0.0	32.6
Sulfuric Acid Mist	< 0.0226	< 0.0229	< 0.0252	< 0.0236	2.04
Unit 2 Removal Efficiency %					
HCl, ppm @ 7% O ₂	99.7	99.8	99.8	99.8	>95% ³
Mercury, ug/DSCM @ 7% O ₂	97.9	97.2	97.8	97.6	>85% ³
SO ₂ , ppm @ 7% O ₂ ⁴	100	---	---	100	>75% ³

¹ – Three one-hour averages calculated from Facility CEMs ppmvd and EPA Method 29 air flow rates

² – Three 24-minute test runs were combined to represent one 72-minute VOC test run.

³ – Permit limits for hydrogen chloride, mercury, and sulfur dioxide are based on concentration or removal efficiency, whichever is less stringent.

⁴ – 24 hour geometric average (from Facility CEMs)

**Table 2-3
Unit 3 Summary of Emissions**

Parameter	Rep. 1	Rep. 2	Rep. 3	Average	Permit Limits
Unit 3 SDA Inlet Concentrations					
Hydrogen Chloride, ppm @ 7% O ₂	1916	681	731	1109	NA
Mercury, ug/DSCM @ 7% O ₂	< 36.7	< 41.0	< 118	< 65.4	NA
Unit 3 FF Outlet Concentrations					
Ammonia, ppm @ 7% O ₂	3.79	4.14	3.49	3.80	50
Carbon Monoxide, ppm @ 7% O ₂ ¹	14	---	---	14	100
Formaldehyde, ng/DSCM @ 7% O ₂	3.09E+04	<1.61E+04	4.36E+04	<3.02E+04	1.03E+05
Hydrogen Chloride, ppm @ 7% O ₂	18.9	4.85	3.44	9.06	29 ⁵
Mercury, ug/DSCM @ 7% O ₂	< 1.30	< 1.29	< 1.28	< 1.29	28 ⁵
Metals					
Cadmium, ug/DSCM @ 7% O ₂	0.239	0.149	0.277	0.222	35
Lead, ug/DSCM @ 7% O ₂	8.24	2.07	3.89	4.73	400
Nitrogen Oxides, ppm @ 7% O ₂ ²	114	---	---	114	185
Opacity, % ³	0.5	0.5	0.7	0.6	10%
Particulate, Gr/DSCF @ 7% O ₂	0.0000915	0.000157	0.000476	0.000241	0.010
Particulate, mg/DSCM @ 7% O ₂	0.209	0.358	1.09	0.552	25
PM10, Gr/DSCF @ 7% O ₂	0.000431	0.000407	0.000270	0.000369	0.010
Sulfur Dioxide, ppm @ 7% O ₂ ⁴	1	---	---	1	29 ⁵

¹ – 4 hour block average (from Facility CEMs)

² – 24 hour arithmetic average (from Facility CEMs)

³ – COMs readings were used to demonstrate compliance with the opacity standard in lieu of EPA Method 9 as per 40CFR60.11(e)(5) (from Facility COMs)

⁴ – 24 hour geometric average (from Facility CEMs)

⁵ – Permit limits for hydrogen chloride, mercury, and sulfur dioxide are based on concentration or removal efficiency, whichever is less stringent.

**Table 2-3
Unit 3 Summary of Emissions
(continued)**

Parameter	Rep. 1	Rep. 2	Rep. 3	Average	Permit Limits
Unit 3 FF Outlet Emission Rates, lbs/hr					
Carbon Monoxide ¹	2.1	2.1	2.5	2.2	15.9
Hydrogen Chloride	3.74	0.975	0.682	1.80	10.3
Hydrogen Fluoride	< 0.0175	< 0.0182	< 0.0179	< 0.0179	0.73
Mercury	<1.68E-04	<1.64E-04	<1.68E-04	<1.67E-04	0.05
Metals					
Arsenic	2.14E-05	2.37E-05	<1.79E-05	<2.10E-05	1.2E-03
Beryllium	<4.51E-06	<4.55E-06	<4.47E-06	<4.51E-06	0.0002
Cadmium	3.09E-05	1.89E-05	3.64E-05	2.88E-05	1.5E-03
Chromium	3.00E-04	2.59E-04	2.40E-04	2.66E-04	1.2E-03
Lead	1.06E-03	2.63E-04	5.11E-04	6.13E-04	0.28
Manganese	2.69E-04	2.64E-04	4.24E-04	3.19E-04	8.6E-03
Nickel	4.91E-04	3.73E-04	8.67E-04	5.77E-04	8.2E-04
Vanadium	<1.80E-05	<1.82E-05	<1.79E-05	<1.80E-05	2.0E-04
Zinc	2.91E-03	3.96E-03	3.13E-03	3.33E-03	8.6E-02
Total Hydrocarbons (VOC), as ethane ²	0.115	0.143	0.159	0.139	6.4
Nitrogen Oxides ¹	28.2	29.6	28.9	28.9	NA
Sulfur Dioxide ¹	0.0	2.8	1.4	1.4	32.6
Sulfuric Acid Mist	< 0.0183	< 0.0198	< 0.0198	< 0.0193	2.04
Unit 3 Removal Efficiency %					
HCl, ppm @ 7% O ₂	99.0	99.3	99.5	99.3	>95% ³
Mercury, ug/DSCM @ 7% O ₂	96.5	96.9	98.9	97.4	>85% ³
SO ₂ , ppm @ 7% O ₂ ⁴	100	---	---	100	>75% ³

¹ – Three one-hour averages calculated from Facility CEMs ppmvd and EPA Method 29 air flow rates

² – Three 24-minute test runs were combined to represent one 72-minute VOC test run.

³ – Permit limits for hydrogen chloride, mercury, and sulfur dioxide are based on concentration or removal efficiency, whichever is less stringent.

⁴ – 24 hour geometric average (from Facility CEMs)

3.0 PROCESS DESCRIPTION AND OPERATION

The Huntington Resource Recovery Facility processes up to 350,400 tons of solid waste each year, generating up to 27.5 megawatts of electricity. The facility was designed and built and is owned and operated by Covanta Projects, of Huntington, Inc. Each of the three (3) Martin GmbH waterwall furnaces has a nominal design capacity of 250 tons of waste per day. Waste is combusted at furnace temperatures exceeding 1,800 degrees Fahrenheit and reduced to an inert ash residue. Before leaving the facility, combustion air is directed through technologically advanced air pollution control equipment consisting of spray dryer absorbers (SDA) and fabric filter (FF) baghouses. Each boiler is also equipped with an ammonia-based selective non-catalytic reduction (SNCR) system for control of NOx emissions and dry activated carbon injection to reduce mercury emissions.

4.0 SAMPLING AND ANALYTICAL METHODS

This section briefly describes the sampling and analytical procedures that were used and any deviations from the methods. Figure 4-1 depicts cross-sections of the SDA Inlet test location and Figure 4-2 depicts cross-sections of the FF Outlet test location.

4.1 EPA Methods 1-4

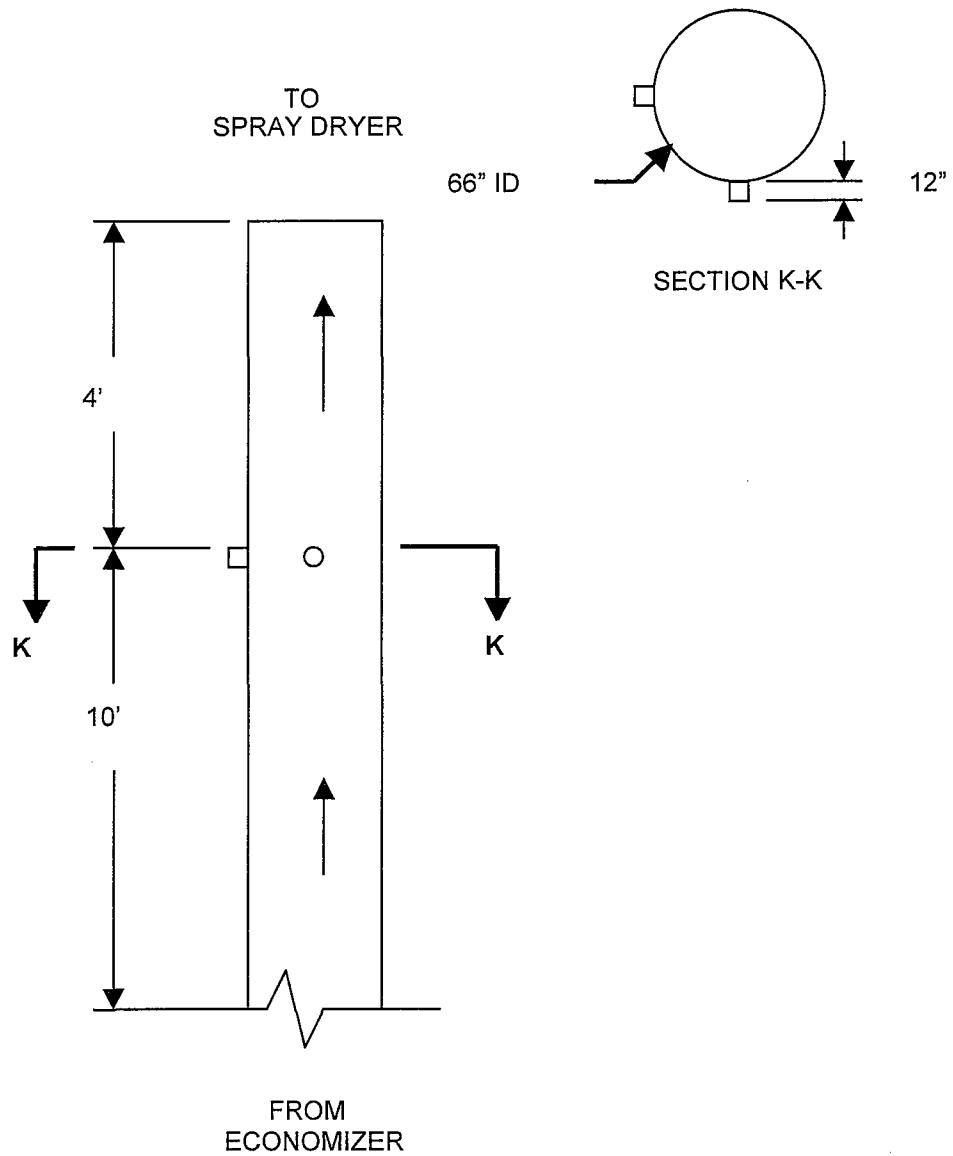
EPA Methods 1 through 4 were utilized in conjunction with each isokinetic test method. EPA Method 1 was used to determine the location of the sampling points. EPA Method 2 was used to measure the flue gas flow rate. EPA Method 3 was used to determine the flue gas molecular weight. EPA Method 4 was used to determine the flue gas moisture content. The information provided by these methods was used in determining isokinetics, parameter concentrations, and parameter emission rates.

4.2 EPA Method 8

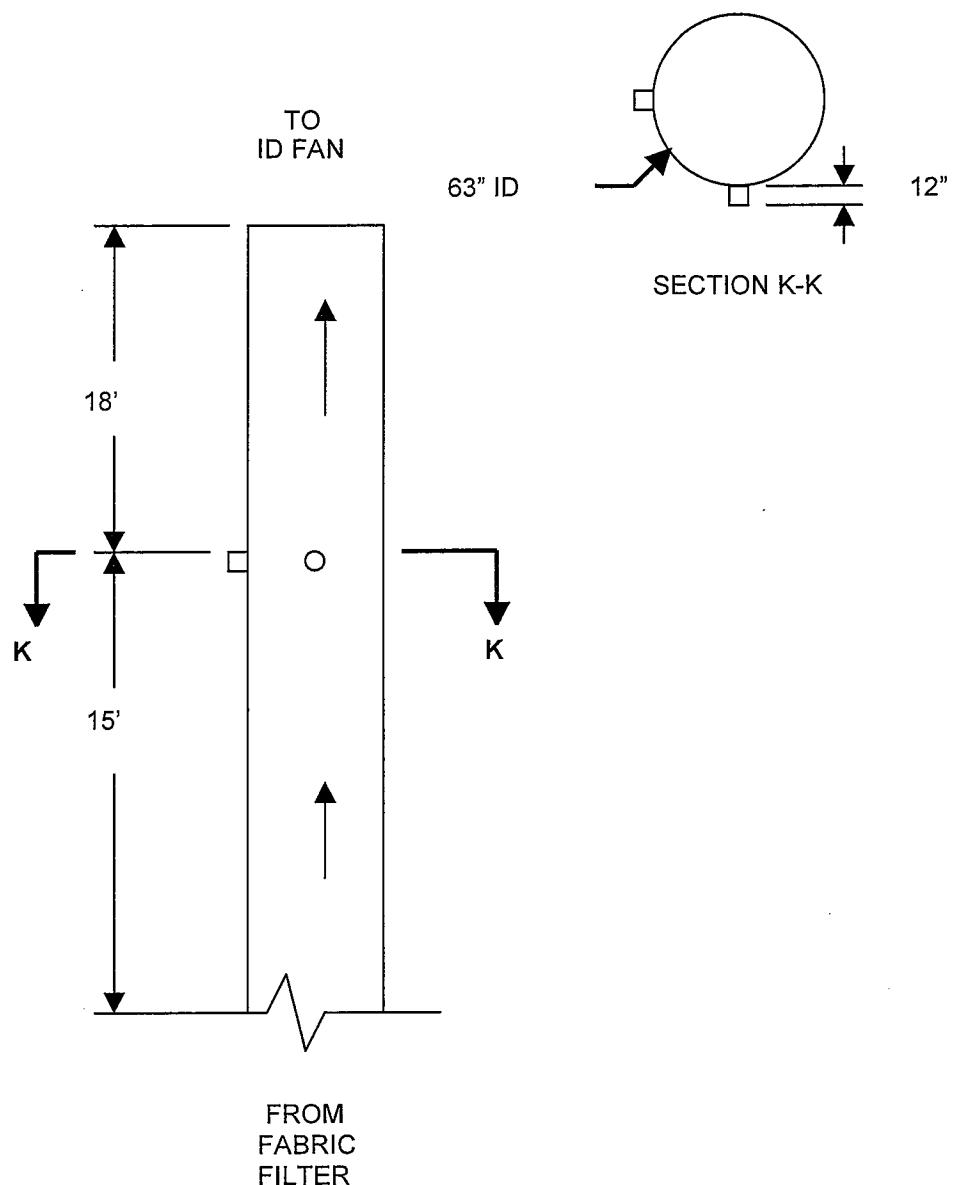
Sulfuric acid mist concentrations and emission rates were determined utilizing EPA Method 8. The EPA Method 8 sampling train consisted of a glass nozzle, a heated glass probe, a heated glass mat filter, one chilled impinger with 100mL of 80% IPA, an unheated glass mat filter, two chilled impingers each with 100mL of 3% H₂O₂, an impinger with 200 grams of silica gel, and a dry gas metering console. The equipment was operated in accordance with EPA Method 8 with no exceptions.

At the end of each test run, the contents of the IPA impinger was poured back into the original IPA reagent jar. The contents of the H₂O₂ impingers were poured back into the original H₂O₂ reagent jar. The silica gel was returned to its original container. The moisture catch in the components was then determined gravimetrically. The nozzle, probe, and filter fronthalf were rinsed with IPA into a sample jar. The heated filter was placed into this sample jar. The filter backhalf, IPA impinger, fronthalf of the second filter, connecting glassware, and the second filter itself were rinsed with DI water into the IPA reagent jar. The backhalf of the second filter, the H₂O₂ impingers, and connecting glassware were rinsed with DI water into the H₂O₂ reagent jar.

The fronthalf portion of the samples was analyzed in accordance with EPA Method 8 for sulfate as sulfuric acid mist using ion chromatography and titrations techniques. The ion chromatography results were utilized in subsequent calculations. The titration results are included in the analytical results for reference.



**Figure 4-1. SDA Inlet Sampling Location
(Units 1, 2, & 3 are identical)**



**Figure 4-2. Fabric Filter Outlet Sampling Location
(Units 1, 2, & 3 are identical)**

4.3 EPA Method 22

The accumulated emissions time of fugitive emissions was determined by observing the process area(s) during normal operations for a pre-determined observation period (three, one-hour test runs). This method does not require that the opacity of emissions be determined, but rather the length of time that any fugitive emissions are visible. Fugitive emissions include emissions that escape capture by exhaust hoods, that are emitted during material transfer, that are emitted from buildings housing material processing or handling equipment, or that are emitted directly from process equipment. If any fugitive emissions are observed during the observation period, the length of time that the emissions are visible is quantified using a stopwatch. This total accumulated time of fugitive emissions is then used to determine compliance with the subpart or permit.

4.4 EPA Method 23

The concentrations and emissions rates of polychlorinated dibenzo-p-dioxins/polychlorinated dibenzofurans (PCDD/PCDF or dioxins/furans), Polyaromatic Hydrocarbons (PAHs), and Polychlorinated Biphenyls (PCBs) were determined utilizing EPA 23. The EPA Method 23 sampling train consisted of a glass nozzle, a heated glass probe, a heated glassmat filter, a condenser, an XAD resin trap, an empty impinger, two chilled impingers each with 100mL of DI water, an empty impinger, an impinger with 200 grams of silica gel, and a dry gas metering console. The equipment was operated in accordance with EPA Method 23 except methylene chloride was not used as a rinse solvent.

At the end of each test run, the nozzle, probe, and filter fronthalf were rinsed with acetone into a sample jar. The filter was recovered dry into a glass petri dish. The filter backhalf, and condenser were rinsed with acetone into the sample jar. All of the components listed above up to the XAD resin trap were rinsed again with toluene into another sample jar. The XAD resin trap was sealed and placed into a chilled ice chest. The contents of the first three impingers were poured back into the original reagent jar. The silica gel was poured back into its original container. The impingers were rinsed with acetone into another sample jar. The moisture catch was then determined gravimetrically.

The samples were analyzed in accordance with EPA Method 23 and Alternate Method 052 for dioxins/furans, SW846 Method 1668A for PCBs, and CARB Method 429 for PAHs.

4.5 EPA Method 26, Modified

Hydrogen chloride concentrations and emission rates were determined at the SDA Inlet utilizing EPA Method 26 modified to use large impingers. The EPA Method 26 sampling train consisted of a heated glass probe, a heated quartz filter, two chilled impingers each with 100mL of

0.1N H₂SO₄, two chilled impingers each with 100mL of DI water, an impinger with 200 grams of silica gel, and a dry gas metering console. The equipment was operated in accordance with EPA Method 26 except that large impingers were used for sample collection.

At the end of each test run, the contents of the H₂SO₄ impingers were poured back into the original H₂SO₄ reagent jar. The contents of the DI impingers were poured back into the original jar. The silica gel was returned to its original container. The moisture catch in the components was determined gravimetrically. The filter backhalf and H₂SO₄ impingers were rinsed with DI water into the H₂SO₄ reagent jar. The DI impingers were rinsed with DI water into the DI reagent jar.

The H₂SO₄ portion of the samples were analyzed in accordance with EPA Method 26 for hydrogen chloride.

4.6 EPA Method 26A

Hydrogen chloride, hydrogen fluoride, and ammonia concentrations and emission rates were determined at the FF Outlet utilizing EPA Method 26A. The EPA Method 26A sampling train consisted of a glass nozzle, a heated glass probe, a heated quartz filter, two chilled impingers each with 100mL of 0.1N H₂SO₄, an empty impinger, an impinger with 200 grams of silica gel, and a dry gas metering console. The equipment was operated in accordance with EPA Method 26A.

At the end of each test run, the contents of the impingers were poured back into the original H₂SO₄ reagent jar. The silica gel was returned to its original container. The moisture catch in the components was determined gravimetrically. The filter backhalf and impingers were rinsed with DI water into the H₂SO₄ reagent jar.

The H₂SO₄ portion of the samples were analyzed in accordance with EPA Method 26A for hydrogen chloride and hydrogen fluoride. The H₂SO₄ portion of the samples were also analyzed for ammonia using ion chromatography techniques.

4.7 EPA Method 29

Particulate and metals concentrations and emission rates were determined utilizing EPA Method 29. The EPA Method 29 sampling train consisted of a glass nozzle, a heated glass probe, a heated tared quartz filter, two chilled impingers each with 100mL of 5%HNO₃/10%H₂O₂, an empty impinger, two chilled impingers each with 100mL of 4%KMnO₄/10%H₂SO₄, an impinger with 200 grams of silica gel, and a dry gas metering console. The equipment was operated in accordance with EPA Method 29 with no exceptions.

At the end of each test run, the nozzle, probe, and filter fronthalf were rinsed with 100 mL of acetone into a sample bottle. The nozzle, probe, and filter fronthalf were rinsed again with 100 mL of 0.1N nitric acid into a sample jar. The filter was recovered dry into another sample bottle. The contents of the 5%HNO₃/10%H₂O₂ impingers were poured back into the original reagent jar. Any

condensate in the empty impinger was poured into a sample bottle. The 4%KMnO₄/10%H₂SO₄ impingers were recovered into another sample jar.

The moisture catch was then determined gravimetrically. The filter backhalf and 5%HNO₃/10%H₂O₂ impingers were rinsed with 100 mL of 0.1N nitric acid into the reagent jar. The empty impinger was rinsed with 100 mL of 0.1N nitric acid into a sample jar. The 4%KMnO₄/10%H₂SO₄ impingers were rinsed with 100 mL of 4%KMnO₄/10%H₂SO₄ and 100 mL of DI water into the jar containing the 4%KMnO₄/10%H₂SO₄ reagent. The 4%KMnO₄/10%H₂SO₄ impingers and connecting glassware were rinsed with 25mL of 8N HCl if any brown residue remained. This HCl rinse was added to a jar containing 200mL of DI water.

The filter and acetone rinses were desiccated and analyzed gravimetrically following EPA Method 5 and 29 techniques. The samples were analyzed in accordance with EPA Method 29 for metals.

4.8 EPA Method 201A

PM10 concentrations and emission rates were determined utilizing EPA Method 201A. The EPA Method 201A sampling train consisted of a stainless steel nozzle, an in-stack cyclone and filter, a heated glass probe, a filter bypass, two impingers containing 100 mL of water each, a dry impinger, an impinger with 200 grams of silica gel, and a dry gas metering console. The equipment was operated in accordance with EPA Method 201A. At the end of each test run, the contents of the first, second, and third impingers were returned to the original jar and measured volumetrically. The silica gel moisture weight gain was obtained gravimetrically. The condensate catch for the test run was determined and entered into moisture calculations. The nozzle and particulate greater than 10 microns portion of the cyclone was rinsed with acetone into a jar. The particulate less than 10 portion of the cyclone was rinsed with acetone into another jar. The filter was recovered dry into a jar. Twelve points (six points per axis on two axes) were each sampled for approximately ten (10) minutes for a total nominal sampling time of 120 minutes. Readings were taken approximately every ten (10) minutes.

The acetone rinses and filter were desiccated and analyzed gravimetrically to determine the particulate greater than and less than 10 microns fractions.

4.9 EPA Method 316

Formaldehyde concentrations and emission rates were determined utilizing EPA Method 316. The EPA Method 316 sampling train consisted of a glass nozzle, a heated glass probe, a heated filter bypass, two chilled impingers each with 100mL of DI, an empty impinger, an impinger with 200 grams of silica gel, and a dry gas metering console. The equipment was operated in accordance with EPA Method 316 with no exceptions.

At the end of each test run, the contents of the first three impingers were poured back into the original reagent jar. The moisture catch was then determined gravimetrically. The nozzle, probe, filter bypass, first three impingers, and connecting glassware were rinsed with DI water and added to the DI reagent bottle. The moisture catch in the silica gel was determined gravimetrically. The samples will then be stored in a chilled ice chest for storage and transport.

The samples were analyzed in accordance with EPA Method 316 for formaldehyde.

4.10 EPA Methods 3A and 25A

Oxygen, carbon dioxide, and total hydrocarbon concentrations were determined utilizing a continuous emissions monitoring (CEM) system as per EPA Methods 3A and 25A. This section presents the sample system description and operation. No deviations from EPA Methods were performed.

The CEM system consisted of an in stack probe, heated out of stack filter, heated transfer lines, condenser, heated Teflon sample lines, sample pump, distribution manifold board, analyzers, and calibration gases. All components of the sampling system that are in contact with the sample are constructed of Teflon, glass, or stainless steel (316). Flue gas was extracted from the source through a three-point stainless steel probe. Flue gas was then passed through a heated Teflon sample line to a tee where the sample was split. Part of the sample remained heated to the hydrocarbon analyzer while the remainder of the sample was diverted into a condenser. This filtering system removes interferences such as particulate and moisture. Conditioned flue gas was then transported via Teflon tubing to a Teflon lined sample pump, through a distribution manifold, and on to various analyzers.

The integrity of this sampling system was verified (as per EPA Methods) using EPA Protocol 1 calibration gases. The design of this sampling system allows the operator to introduce calibration gases at the outlet of the probe, prior to the heated out of stack filter (for the system bias check and calibration drift check), and directly into the analyzers (for linearity checks).

TESTAR utilized a CAI (California Analytical Instruments, Inc.) Model 300 HFID Heated Hydrocarbon Analyzer. This model analyzer uses Flame Ionization Detection (FID) to determine the total hydrocarbon concentration (on a wet basis) within a gaseous sample. The analyzer has an adjustable heated oven which contains a heated pump and a burner in which a small flame is elevated and sustained by regulated flows of air and a mixture of hydrogen and helium. The burner jet is used as an electrode and is connected to the negative side of a precision power supply. An additional electrode, known as the 'collector', is connected to a high impedance, low noise electronic amplifier. The two electrodes establish an electrostatic field. When a gaseous sample is introduced to the burner, it is ionized in the flame and the electrostatic field causes the charged particles (ions) to migrate to their respective electrodes. The migration creates a small current between the electrodes. This current is measured by the precision electrometer amplified and is directly proportional to the hydrocarbon concentration of the sample.

5.0 QA/QC RESULTS

5.1 QA/QC Policy Procedures

TESTAR, Inc. is committed to adhering to Quality Assurance/Quality Control (QA/QC) procedures and objectives that meet or exceed the relevant EPA guidance. Our procedures include calibration of equipment as appropriate, proper glassware pre-cleaning to prevent contamination of samples, proper sample recovery, documented sample custody, blank samples, duplicate analyses, matrix spike recovery, and validated computer generated results. We also adhere to other method specific criteria such as maintaining isokinetic conditions during particulate type testing and posttest leak checks.

TESTAR, Inc. uses oil manometers to determine velocity differential pressures thus eliminating potential errors from magnehelic gauges. The manometers are leveled and zeroed prior to taking any measurements. All equipment used onsite undergoes a pretest audit and operational check for accuracy. Dry gas meters are checked by using an orifice to determine the meter gamma. The audit gamma must be within 3% of the full test gamma for the meter to be acceptable. Likewise, all thermocouples are checked at ambient temperature versus an ASTM reference thermometer or a thermometer that has been checked against an ASTM reference thermometer. The reading must agree within 2°F. Additionally, the barometer is checked against a reference barometer prior to each project and must agree within 0.1" Hg.

After each testing project, the dry gas meter undergoes a posttest audit following the guidelines of Alternate Method 009. Alternate Method 009 utilizes a mathematical calculation to check the dry gas meter calibration factor (gamma) versus the full test calibration factor. The gamma must agree within $\pm 5\%$ of the full test gamma.

5.2 Sample Custody and Preservation

Proper sample custody and preservation techniques ensure that the samples collected and analyzed are the same, that the sample did not change in concentration prior to analysis, and that the sample was not tampered with prior to analysis. To ensure accurate results, TESTAR collects and transports samples in clean containers that are inert to the matrix enclosed, that will not contaminate the sample, and that prevent photochemical reactions when appropriate. All samples contain unique identifiers that include the client name, facility name, TESTAR project number, collection date, unique run number, sample fraction, and matrix. Liquid levels are marked in order to determine if any leakage occurred during transport. Samples are accompanied by sample custody forms identifying the client, facility, project number, sample, fractions, collection date, etc. When custody is relinquished to the laboratory, the receiving sample custodian signs the form.

5.3 Sample Blanks, Duplicates, and Matrix Spikes

Several types of blanks are utilized depending upon the project QA objectives. Typical blanks include field blanks, reagent blanks, and trip blanks. Blanks help to identify the source of contamination if contamination is suspected based upon the result validation procedure. Trip blanks are typically not analyzed unless the field blank shows significant contamination. Field blanks and reagent blanks are analyzed during most testing programs involving metals unless requested not to do so by the client. Field blanks are analyzed during most programs involving organics such as dioxins/furans.

Duplicates and matrix spikes are analyzed for projects involving metals testing. At least 10% of the samples are analyzed in duplicate for metals and at least one matrix spike is performed. All mercury analyses are performed in duplicate.

Breakthrough analyses are performed for projects involving organics utilizing adsorbent tubes. Adsorbent tubes are desorbed and analyzed separately to determine if any breakthrough occurred. Breakthrough is said to have occurred if the organic catch weight on the last fraction (generally the backhalf of the last adsorbent tube) is more than 10% of the total train organic catch.

5.4 Data Validation and Presentation

The field test engineer is responsible for reviewing and validating data as it is obtained. Additionally the onsite project manager reviews data for consistency, completeness, and accuracy prior to leaving the site. This validation procedure is based upon their knowledge of the process being tested and/or similar sources as well as checks built into the software being utilized. This allows for error correction or for the testing to be repeated immediately rather than at a later undetermined date. The data undergoes another review by a Project Director upon return to headquarters. Analytical data is reviewed by the QA Director upon submittal by the analytical laboratory to resolve any conflicts or concerns as soon as possible rather than after the results have been calculated.

Data is collected using computerized spreadsheets in the field and the results are calculated using validated computer programs to prevent erroneous calculations.

5.5 QA/QC Results

This section presents QA/QC results from measures taken during the testing program. The results are summarized in the following tables for easy reference.

**Table 5-1
Summary of QA/QC Procedures**

Test Method	QA/QC Procedure	QA/QC Objective	QA/QC Results	Status of QA/QC
EPA M201A	Acetone Blank	< 1.0E-5 mg/mg	0.00E-06 mg/mg	Acceptable
EPA M8	Reagent Blank	ND	< 0.105 mg	Acceptable
	Matrix Spike	90 – 110 %	102.8 %	Acceptable
EPA M23	Internal Standard Recoveries (4-6)	40 – 130 %	80.5 – 101 %	Acceptable
	Internal Standard Recoveries (7-8)	25 – 130 %	79.6 – 90.7 %	Acceptable
	Surrogate Standard Recoveries	70 – 130 %	90.9 – 103 %	Acceptable
EPA M26A	HCl Reagent Blank	ND	< 0.041 mg	Acceptable
	HCl Spike	90 – 110 %	100.2 %	Acceptable
EPA M26A	HF Reagent Blank	ND	< 0.043 mg	Acceptable
	HF Spike	90 – 110 %	90.7 %	Acceptable
EPA M26A	NH3 Reagent Blank	ND	< 0.200 mg	Acceptable
	NH3 Spike	90 – 110 %	103.3 %	Acceptable
EPA M29	Acetone Blank	< 1.0E-5 mg/mg	0.00E-06 mg/mg	Acceptable
	Duplicate RPD	≤ 20 %	0 – 12.1 %	Acceptable
Arsenic	Reagent Blank	NA	< 0.2 ug	Acceptable
Beryllium	Reagent Blank	NA	< 0.05 ug	Acceptable
Cadmium	Reagent Blank	NA	< 0.2 ug	Acceptable
Chromium	Reagent Blank	NA	1.19 ug	Acceptable, NO blank correction
Lead	Reagent Blank	NA	0.292 ug	Acceptable, NO blank correction
Manganese	Reagent Blank	NA	1.33 ug	Acceptable, NO blank correction
Nickel	Reagent Blank	NA	1.74 ug	Acceptable, NO blank correction
Vanadium	Reagent Blank	NA	< 0.2 ug	Acceptable
Zinc	Reagent Blank	NA	2.90 ug	Acceptable, NO blank correction
	Spike Recoveries	75 – 125 %	69 – 109 %	Acceptable ¹
Mercury	Duplicate RPD	≤ 20 %	0 – 9.8 %	Acceptable
	Reagent Blank	ND	< 0.5 ug	Acceptable
	Spike Recoveries	75 – 125 %	78 – 117 %	Acceptable
EPA M316	Reagent Blank	ND	< 5.29 ug	Acceptable
	Field Blank	ND	< 11.1 ug	Acceptable
	In-House Audit	≤ 10 %	- 2.99 %	Acceptable

¹ Please refer to Appendix C.4 for further discussion.

APPENDIX A
Test Results

APPENDIX A.1
Test Results

Unit 1 SDA Inlet
Hydrogen Chloride

ISOKINETIC SAMPLING TRAIN RESULTS - METHOD:

MM26

Client Name	Covanta Energy Group, Inc.	Operator	CAN
Plant Name	Huntington Resource Recovery Facility	Project #	10843
Sampling Location	Unit 1 SDA Inlet	Standard Temperature, °F	68

USE IN AVERAGE OF RUN SET? 1 or 0 =>	1	1	1	SET AVERAGE
Run Number	1-I-MM26-1	1-I-MM26-2	1-I-MM26-3	
Run Date	09/05/12	09/05/12	09/05/12	
Run Start Time	hh:mm	851	1121	
Run Stop Time	hh:mm	1000	1228	1452

Sampling Parameters

Meter Calibration Factor	Y	1.0029	1.0029	1.0029	
Y _{QA} Calculated by Test Run	Y _{QA}	1.0447	1.0498	1.0250	
Y _{QA} PASS/FAIL by Test Run	Check	PASS	PASS	PASS	PASS
Pitot Tube Coefficient	C _p	0.84	0.84	0.84	
Stack/Duct Static Pressure	in H ₂ O	-3.60	-3.60	-3.60	-3.60
Barometric Pressure	in Hg	29.6	29.6	29.6	29.6
Carbon Dioxide Percentage	% CO ₂	9.5	9.5	9.5	9.5
Oxygen Percentage	% O ₂	10.2	10.1	10.0	10.1
Carbon Monoxide Percentage	% CO	0.0	0.0	0.0	0.0
Nitrogen Percentage	% N ₂	80.3	80.4	80.5	80.4
Total Water Volume Collected	mL	151.1	127.2	160.5	146.3
Sample Volume	ft ³	39.047	38.818	39.605	39.157
Average Meter Temperature	°F	93	92	88	91
Average Delta H	in H ₂ O	1.40	1.40	1.40	1.40
Total Sampling Time	min	60	60	60	60

Air Flow Parameters

Volume of Water vapor @ STP	SCF	7.112	5.987	7.555	6.885
Volume Metered @ STP	DSCF	37.081	36.947	37.992	37.340
Absolute Stack/Duct Pressure	in Hg	29.3	29.3	29.3	29.3
Absolute Meter Pressure	in Hg	29.7	29.7	29.7	29.7
Calculated Stack Moisture	% H ₂ O	16.1	13.9	16.6	15.5

Concentration and Emission Rate Data Summary

Hydrogen Chloride	mg	1005	751	693	
Molecular Weight	MW	36.46	36.46	36.46	
Concentration, ppm	ppm	631	474	425	510
Concentration @ 12% CO ₂	ppm@12%	798	598	537	644
Concentration @ 7% O ₂	ppm@7%	820	609	542	657

APPENDIX A.2
Test Results

Unit 1 SDA Inlet
Mercury

ISOKINETIC SAMPLING TRAIN RESULTS - METHOD

M29

Client Name	Covanta Energy Group, Inc.	Operator	CAN
Plant Name	Huntington Resource Recovery Facility	Project #	10843
Sampling Location	Unit 1 SDA Inlet	Standard Temperature, °F	68

USE IN AVERAGE OF RUN SET? 1 or 0 =>	1	1	1	SET AVERAGE
Run Number	1-I-M29-1	1-I-M29-2	1-I-M29-3	
Run Date	09/05/12	09/05/12	09/05/12	
Run Start Time	hh:mm	820	1050	
Run Stop Time	hh:mm	1033	1259	1524

Sampling Parameters

Meter Calibration Factor	Y	1.0108	1.0108	1.0108	
Y _{QA} Calculated by Test Run	Y _{QA}	0.9903	0.9910	1.0029	
Y _{QA} PASS/FAIL by Test Run	Check	PASS	PASS	PASS	PASS
Pitot Tube Coefficient	C _p	0.84	0.84	0.84	
Stack/Duct Static Pressure	in H ₂ O	-3.60	-3.60	-3.60	-3.60
Stack Cross-Sectional Area	ft ²	23.758	23.758	23.758	23.758
Barometric Pressure	in Hg	29.6	29.6	29.6	29.6
Actual Nozzle Diameter	in	0.234	0.236	0.234	
Carbon Dioxide Percentage	% CO ₂	9.5	9.5	9.5	9.5
Oxygen Percentage	% O ₂	10.2	10.1	10.0	10.1
Carbon Monoxide Percentage	% CO	0.0	0.0	0.0	0.0
Nitrogen Percentage	% N ₂	80.3	80.4	80.5	80.4
Total Water Volume Collected	mL	271.8	229.1	261.2	254.0
Sample Volume	ft ³	68.930	67.260	65.955	67.382
Average Meter Temperature	°F	96	93	88	92
Average Stack Temperature	°F	440	441	446	443
Average Delta H	in H ₂ O	0.92	0.88	0.88	0.89
Total Sampling Time	min	120	120	120	120

Air Flow Parameters

Volume of Water vapor @ STP	SCF	12.794	10.784	12.295	11.957
Volume Metered @ STP	DSCF	65.606	64.314	63.658	64.526
Absolute Stack/Duct Pressure	in Hg	29.3	29.3	29.3	29.3
Absolute Meter Pressure	in Hg	29.7	29.7	29.7	29.7
Calculated Stack Moisture	% H ₂ O	16.3	14.4	16.2	15.6
Dry Mole Fraction	decimal	0.837	0.856	0.838	0.844
Avg Differential Pressure (Delta P)	in H ₂ O	0.734	0.678	0.696	0.702
Dry Gas Molecular Weight	lb/lb-mole	29.93	29.92	29.92	29.92
Wet Stack Gas Molecular Weight	lb/lb-mole	27.98	28.21	27.99	28.06
Average Stack Gas Velocity	ft/sec	64.41	61.70	62.94	63.02
Percent of Isokinetic Rate	% ISO	98.5	96.9	98.3	97.9

Air Flow Rate Results

Actual Stack Flow/Minute	ACFM	91,819	87,955	89,717	89,830
Dry Standard Stack Flow/Minute	DSCFM	44,184	43,261	42,950	43,465

Concentration and Emission Rate Data Summary

Mercury (Hg)	ug	< 110.298	< 63.885	< 77.268	< 83.817
Concentration ug/DSCM	ug/DSCM	< 59.4	< 35.1	< 42.9	< 45.8
Concentration ug @ 12% CO ₂	ug@12%	< 75.0	< 44.3	< 54.1	< 57.8
Concentration ug @ 7% O ₂	ug@7%	< 77.1	< 45.1	< 54.7	< 59.0
Emission Rate, lb/hr	lb/hr	< 9.83E-03	< 5.68E-03	< 6.90E-03	< 7.47E-03

APPENDIX A.3
Test Results

Unit 1 FF Outlet
Ammonia, Hydrogen Chloride, and Hydrogen Fluoride

ISOKINETIC SAMPLING TRAIN RESULTS - METHOD:

M26A

Client Name	Covanta Energy Group, Inc.			Operator	SGD
Plant Name	Huntington Resource Recovery Facility			Project #	10843
Sampling Location	Unit 1 FF Outlet			Standard Temperature, °F	68
USE IN AVERAGE OF RUN SET? 1 or 0 =>	1	1	1	SET AVERAGE	
Run Number		1-O-M26A-1	1-O-M26A-2		
Run Date		09/05/12	09/05/12		
Run Start Time	hh:mm	851	1121		
Run Stop Time	hh:mm	1000	1228		
Sampling Parameters					
Meter Calibration Factor	Y	1.0192	1.0192	1.0192	
Y_{QA} Calculated by Test Run	Y _{QA}	1.0302	1.0456	1.0257	
Y_{QA} PASS/FAIL by Test Run	Check	PASS	PASS	PASS	PASS
Pitot Tube Coefficient	C _p	0.84	0.84	0.84	
Stack/Duct Static Pressure	in H ₂ O	-14.50	-15.00	-15.00	-14.83
Stack Cross-Sectional Area	ft ²	21.648	21.648	21.648	21.648
Barometric Pressure	in Hg	29.6	29.6	29.6	29.6
Actual Nozzle Diameter	in	0.220	0.218	0.220	
Carbon Dioxide Percentage	% CO ₂	8.5	8.4	8.4	8.4
Oxygen Percentage	% O ₂	11.1	11.3	11.3	11.2
Carbon Monoxide Percentage	% CO	0.0	0.0	0.0	0.0
Nitrogen Percentage	% N ₂	80.4	80.3	80.3	80.3
Total Water Volume Collected	mL	176.5	148.9	183.7	169.7
Sample Volume	ft ³	38.330	35.600	36.778	36.903
Average Meter Temperature	°F	82	84	79	82
Average Stack Temperature	°F	286	284	284	285
Average Delta H	in H ₂ O	1.31	1.16	1.20	1.22
Total Sampling Time	min	60	60	60	60
Air Flow Parameters					
Volume of Water vapor @ STP	SCF	8.308	7.009	8.647	7.988
Volume Metered @ STP	DSCF	37.758	34.954	36.410	36.374
Absolute Stack/Duct Pressure	in Hg	28.5	28.5	28.5	28.5
Absolute Meter Pressure	in Hg	29.7	29.7	29.7	29.7
Calculated Stack Moisture	% H ₂ O	18.0	16.7	19.2	18.0
Saturated Stack Moisture	% H ₂ O	100.0	100.0	100.0	100.0
Reported Stack Moisture Content	% H ₂ O	18.0	16.7	19.2	18.0
Dry Mole Fraction	decimal	0.820	0.833	0.808	0.820
Avg Differential Pressure (Delta P)	in H ₂ O	1.112	1.017	1.021	1.050
Dry Gas Molecular Weight	lb/lb-mole	29.80	29.80	29.80	29.80
Wet Stack Gas Molecular Weight	lb/lb-mole	27.68	27.83	27.53	27.68
Average Stack Gas Velocity	ft/sec	73.60	70.16	70.68	71.48
Percent of Isokinetic Rate	% ISO	97.6	94.9	99.3	97.3
Air Flow Rate Results					
Actual Stack Flow/Minute	ACFM	95,596	91,124	91,802	92,841
Dry Standard Stack Flow/Minute	DSCFM	52,897	51,288	50,129	51,438

Concentration and Emission Rate Data Summary					
Hydrogen Chloride	mg	1.72	2.35	1.91	
Molecular Weight	MW	36.46	36.46	36.46	
Concentration, ppm	ppm	1.06	1.57	1.22	1.28
Concentration @ 12% CO ₂	ppm@12%	1.50	2.24	1.75	1.83
Concentration @ 7% O ₂	ppm@7%	1.51	2.27	1.77	1.85
Emission Rate, lb/hr	lb/hr	0.319	0.456	0.348	0.374
Ammonia	mg	2.07	1.40	1.73	
Molecular Weight	MW	17.01	17.01	17.01	
Concentration, ppm	ppm	2.74	2.00	2.37	2.37
Concentration @ 12% CO ₂	ppm@12%	3.87	2.86	3.39	3.37
Concentration @ 7% O ₂	ppm@7%	3.88	2.90	3.44	3.40
Emission Rate, lb/hr	lb/hr	0.384	0.272	0.315	0.323
Hydrogen Fluoride as HF	mg	< 0.098	< 0.096	< 0.098	
Molecular Weight	MW	20.01	20.01	20.01	
Concentration, ppm	ppm	< 0.110	< 0.117	< 0.114	< 0.114
Concentration @ 12% CO ₂	ppm@12%	< 0.156	< 0.167	< 0.163	< 0.162
Concentration @ 7% O ₂	ppm@7%	< 0.156	< 0.169	< 0.165	< 0.164
Emission Rate, lb/hr	lb/hr	< 0.0182	< 0.0186	< 0.0178	< 0.0182

Removal Efficiency Summary For:

HCl

Unit #	Repetition Number	ppm @ 7 % O2		Removal Efficiency, %
		Inlet Result	Outlet Result	
1	1	820	1.51	99.8%
	2	609	2.27	99.6%
	3	542	1.77	99.7%
AVERAGE =>				99.7%

APPENDIX A.4
Test Results

Unit 1 FF Outlet
Formaldehyde

ISOKINETIC SAMPLING TRAIN RESULTS - METHOD:

M316

Client Name	Covanta Energy Group, Inc.	Operator	SGD
Plant Name	Huntington Resource Recovery Facility	Project #	10843
Sampling Location	Unit 1 FF Outlet	Standard Temperature, °F	68

USE IN AVERAGE OF RUN SET? 1 or 0 =>	1	1	1	SET AVERAGE
Run Number		1-O-M316-1	1-O-M316-2	
Run Date		08/28/12	08/28/12	
Run Start Time	hh:mm	1019	1315	
Run Stop Time	hh:mm	1123	1420	1712

Sampling Parameters

Meter Calibration Factor	Y	1.0192	1.0192	1.0192	
Y _{QA} Calculated by Test Run	Y _{QA}	1.0083	1.0315	1.0213	
Y _{QA} PASS/FAIL by Test Run	Check	PASS	PASS	PASS	PASS
Pitot Tube Coefficient	C _p	0.84	0.84	0.84	
Stack/Duct Static Pressure	in H ₂ O	-15.50	-15.50	-15.60	-15.53
Stack Cross-Sectional Area	ft ²	21.648	21.648	21.648	21.648
Barometric Pressure	in Hg	29.7	29.7	29.7	29.7
Actual Nozzle Diameter	in	0.216	0.218	0.216	
Carbon Dioxide Percentage	% CO ₂	8.4	8.2	8.4	8.3
Oxygen Percentage	% O ₂	11.4	11.6	11.3	11.4
Carbon Monoxide Percentage	% CO	0.0	0.0	0.0	0.0
Nitrogen Percentage	% N ₂	80.2	80.2	80.3	80.2
Total Water Volume Collected	mL	155.0	166.0	147.5	156.2
Sample Volume	ft ³	35.018	36.231	34.083	35.111
Average Meter Temperature	°F	82	85	86	84
Average Stack Temperature	°F	285	284	283	284
Average Delta H	in H ₂ O	1.05	1.17	1.01	1.08
Total Sampling Time	min	60	60	60	60

Air Flow Parameters

Volume of Water vapor @ STP	SCF	7.296	7.814	6.943	7.351
Volume Metered @ STP	DSCF	34.591	35.613	33.423	34.542
Absolute Stack/Duct Pressure	in Hg	28.6	28.6	28.6	28.6
Absolute Meter Pressure	in Hg	29.8	29.8	29.8	29.8
Calculated Stack Moisture	% H ₂ O	17.4	18.0	17.2	17.5
Dry Mole Fraction	decimal	0.826	0.820	0.828	0.825
Avg Differential Pressure (Delta P)	in H ₂ O	0.961	1.032	0.928	0.974
Dry Gas Molecular Weight	lb/lb-mole	29.80	29.78	29.80	29.79
Wet Stack Gas Molecular Weight	lb/lb-mole	27.74	27.66	27.77	27.72
Average Stack Gas Velocity	ft/sec	68.23	70.83	66.98	68.68
Percent of Isokinetic Rate	% ISO	99.1	97.1	97.1	97.7

Air Flow Rate Results

Actual Stack Flow/Minute	ACFM	88,618	91,996	86,999	89,204
Dry Standard Stack Flow/Minute	DSCFM	49,534	51,087	48,833	49,818

Concentration and Emission Rate Data Summary

Formaldehyde	ug	58.0	36.2	33.5	
Molecular Weight	MW	30.03	30.03	30.03	
Concentration ug/DSCM	ug/DSCM	59.2	35.9	35.4	43.5
Concentration @ 12% CO ₂	ug@12%	84.6	52.5	50.6	62.6
Concentration @ 7% O ₂	ug@7%	86.6	53.6	51.2	63.8
Emission Rate, lb/hr	lb/hr	1.10E-02	6.87E-03	6.47E-03	8.11E-03

APPENDIX A.5
Test Results

Unit 1 FF Outlet
Particulate and Metals

ISOKINETIC SAMPLING TRAIN RESULTS - METHOD

M29

Client Name	Covanta Energy Group, Inc.			Operator	JMA
Plant Name	Huntington Resource Recovery Facility			Project #	10843
Sampling Location	Unit 1 FF Outlet			Standard Temperature, °F	68
USE IN AVERAGE OF RUN SET? 1 or 0 =>	1	1	1	SET AVERAGE	
Run Number		1-O-M29-1	1-O-M29-2		
Run Date		09/05/12	09/05/12		
Run Start Time	hh:mm	820	1050		
Run Stop Time	hh:mm	1033	1259		
Sampling Parameters					
Meter Calibration Factor	Y	1.0065	1.0065	1.0065	
Y _{OA} Calculated by Test Run	Y _{OA}	1.0000	0.9972	1.0019	
Y _{OA} PASS/FAIL by Test Run	Check	PASS	PASS	PASS	PASS
Pitot Tube Coefficient	C _p	0.84	0.84	0.84	
Stack/Duct Static Pressure	in H ₂ O	-14.50	-14.50	-14.50	-14.50
Stack Cross-Sectional Area	ft ²	21.648	21.648	21.648	21.648
Barometric Pressure	in Hg	29.6	29.6	29.6	29.6
Actual Nozzle Diameter	in	0.218	0.218	0.218	
Carbon Dioxide Percentage	% CO ₂	8.5	8.4	8.4	8.4
Oxygen Percentage	% O ₂	11.1	11.3	11.3	11.2
Carbon Monoxide Percentage	% CO	0.0	0.0	0.0	0.0
Nitrogen Percentage	% N ₂	80.4	80.3	80.3	80.3
Total Water Volume Collected	mL	374.3	320.3	367.0	353.9
Sample Volume	ft ³	76.368	73.098	75.628	75.031
Average Meter Temperature	°F	84	86	83	84
Average Stack Temperature	°F	285	284	285	285
Average Delta H	in H ₂ O	1.34	1.22	1.32	1.30
Total Sampling Time	min	120	120	120	120
Air Flow Parameters					
Volume of Water vapor @ STP	SCF	17.618	15.077	17.275	16.657
Volume Metered @ STP	DSCF	74.039	70.612	73.411	72.688
Absolute Stack/Duct Pressure	in Hg	28.5	28.5	28.5	28.5
Absolute Meter Pressure	in Hg	29.7	29.7	29.7	29.7
Calculated Stack Moisture	% H ₂ O	19.2	17.6	19.0	18.6
Saturated Stack Moisture	% H ₂ O	100.0	100.0	100.0	100.0
Reported Stack Moisture Content	% H ₂ O	19.2	17.6	19.0	18.6
Dry Mole Fraction	decimal	0.808	0.824	0.810	0.814
Avg Differential Pressure (Delta P)	in H ₂ O	1.074	0.975	1.059	1.036
Dry Gas Molecular Weight	lb/lb-mole	29.80	29.80	29.80	29.80
Wet Stack Gas Molecular Weight	lb/lb-mole	27.54	27.72	27.55	27.60
Average Stack Gas Velocity	ft/sec	72.49	68.78	71.95	71.07
Percent of Isokinetic Rate	% ISO	100.3	98.7	100.0	99.7
Air Flow Rate Results					
Actual Stack Flow/Minute	ACFM	94,157	89,336	93,448	92,314
Dry Standard Stack Flow/Minute	DSCFM	51,390	49,824	51,132	50,782

Concentration and Emission Rate Data Summary						
Filterable Particulate	mg	1.3	0.9	0.8		1.0
Concentration, Gr/DSCF	gr/DSCF	2.71E-04	1.97E-04	1.68E-04		2.12E-04
Concentration @ 12% CO ₂	Gr@12%	3.83E-04	2.81E-04	2.40E-04		3.01E-04
Concentration @ 7% O ₂	Gr@7%	3.84E-04	2.85E-04	2.44E-04		3.04E-04
Concentration mg/DSCM	mg/DSCM	0.620	0.450	0.385		0.485
Concentration mg @ 7% O ₂	mg@7%	0.879	0.652	0.557		0.696
Emission Rate, lb/hr	lb/hr	0.119	0.0840	0.0737		0.0924
Arsenic (As)	ug	< 0.200	< 0.200	< 0.200		< 0.200
Concentration ug/DSCM	ug/DSCM	< 0.095	< 0.100	< 0.096		< 0.097
Concentration ug @ 12% CO ₂	ug@12%	< 0.135	< 0.143	< 0.137		< 0.138
Concentration ug @ 7% O ₂	ug@7%	< 0.135	< 0.145	< 0.139		< 0.140
Emission Rate, lb/hr	lb/hr	< 1.84E-05	< 1.87E-05	< 1.84E-05		< 1.85E-05
Beryllium (Be)	ug	< 0.050	< 0.050	< 0.050		< 0.050
Concentration ug/DSCM	ug/DSCM	< 0.0238	< 0.0250	< 0.0240		< 0.0243
Concentration ug @ 12% CO ₂	ug@12%	< 0.0337	< 0.0357	< 0.0344		< 0.0346
Concentration ug @ 7% O ₂	ug@7%	< 0.0338	< 0.0362	< 0.0348		< 0.0349
Emission Rate, lb/hr	lb/hr	< 4.59E-06	< 4.67E-06	< 4.61E-06		< 4.62E-06
Cadmium (Cd)	ug	0.304	< 0.200	0.442		< 0.315
Concentration ug/DSCM	ug/DSCM	0.145	< 0.100	0.213		< 0.153
Concentration ug @ 12% CO ₂	ug@12%	0.205	< 0.143	0.304		< 0.217
Concentration ug @ 7% O ₂	ug@7%	0.206	< 0.145	0.308		< 0.219
Emission Rate, lb/hr	lb/hr	2.79E-05	< 1.87E-05	4.07E-05		< 2.91E-05
Total Chromium (Cr)	ug	3.630	3.700	2.790		3.373
Concentration ug/DSCM	ug/DSCM	1.73	1.85	1.34		1.64
Concentration ug @ 12% CO ₂	ug@12%	2.44	2.64	1.92		2.33
Concentration ug @ 7% O ₂	ug@7%	2.46	2.68	1.94		2.36
Emission Rate, lb/hr	lb/hr	3.33E-04	3.45E-04	2.57E-04		3.12E-04
Lead (Pb)	ug	4.080	2.175	6.910		4.388
Concentration ug/DSCM	ug/DSCM	1.95	1.09	3.32		2.12
Concentration ug @ 12% CO ₂	ug@12%	2.75	1.55	4.75		3.02
Concentration ug @ 7% O ₂	ug@7%	2.76	1.57	4.81		3.05
Emission Rate, lb/hr	lb/hr	3.75E-04	2.03E-04	6.37E-04		4.05E-04
Manganese (Mn)	ug	3.980	3.810	5.000		4.263
Concentration ug/DSCM	ug/DSCM	1.90	1.91	2.40		2.07
Concentration ug @ 12% CO ₂	ug@12%	2.68	2.72	3.44		2.95
Concentration ug @ 7% O ₂	ug@7%	2.69	2.76	3.48		2.98
Emission Rate, lb/hr	lb/hr	3.65E-04	3.56E-04	4.61E-04		3.94E-04
Mercury (Hg)	ug	< 2.221	< 1.800	< 1.900		< 1.974
Concentration ug/DSCM	ug/DSCM	< 1.06	< 0.900	< 0.914		< 0.958
Concentration ug @ 12% CO ₂	ug@12%	< 1.50	< 1.29	< 1.31		< 1.36
Concentration ug @ 7% O ₂	ug@7%	< 1.50	< 1.30	< 1.32		< 1.38
Emission Rate, lb/hr	lb/hr	< 2.04E-04	< 1.68E-04	< 1.75E-04		< 1.82E-04

Nickel (Ni)	ug	7.130	9.010	6.240		7.460
Concentration ug/DSCM	ug/DSCM	3.40	4.51	3.00		3.64
Concentration ug @ 12% CO2	ug@12%	4.80	6.44	4.29		5.17
Concentration ug @ 7% O₂	ug@7%	4.82	6.52	4.35		5.23
Emission Rate, lb/hr	lb/hr	6.55E-04	8.41E-04	5.75E-04		6.90E-04

Vanadium (V)	ug	< 0.200	< 0.200	< 0.200		< 0.200
Concentration ug/DSCM	ug/DSCM	< 0.095	< 0.100	< 0.096		< 0.097
Concentration ug @ 12% CO2	ug@12%	< 0.135	< 0.143	< 0.137		< 0.138
Concentration ug @ 7% O₂	ug@7%	< 0.135	< 0.145	< 0.139		< 0.140
Emission Rate, lb/hr	lb/hr	< 1.84E-05	< 1.87E-05	< 1.84E-05		< 1.85E-05

Zinc (Zn)	ug	25.800	17.200	26.300		23.100
Concentration ug/DSCM	ug/DSCM	12.3	8.6	12.7		11.2
Concentration ug @ 12% CO2	ug@12%	17.4	12.3	18.1		15.9
Concentration ug @ 7% O₂	ug@7%	17.5	12.5	18.3		16.1
Emission Rate, lb/hr	lb/hr	2.37E-03	1.61E-03	2.42E-03		2.13E-03

Removal Efficiency Summary For: Mercury

Unit #	Repitition Number	ug/DSCM @ 7% O2		Removal Efficiency, %
		Inlet Result	Stack Result	
1	1	< 77.1	< 1.50	98.1%
	2	< 45.1	< 1.30	97.1%
	3	< 54.7	< 1.32	97.6%
AVERAGE =>				97.6%

APPENDIX A.6
Test Results

Unit 1 FF Outlet
PM10

ISOKINETIC SAMPLING TRAIN RESULTS - METHOD:

M201A

Client Name	Covanta Energy Group, Inc.	Operator	WES
Plant Name	Huntington Resource Recovery Facility	Project #	10843
Sampling Location	Unit 1 FF Outlet	Standard Temperature, °F	68

USE IN AVERAGE OF RUN SET? 1 or 0 =>	1	1	1	SET AVERAGE
Run Number	1-O-M201A-1	1-O-M201A-2	1-O-M201A-3	
Run Date	08/30/12	08/30/12	08/30/12	
Run Start Time	hh:mm	802	1106	
Run Stop Time	hh:mm	1013	1313	1612

Sampling Parameters

Meter Calibration Factor	Y	1.0192	1.0192	1.0192	
Y _{QA} Calculated by Test Run	Y _{QA}	1.0112	0.9946	1.0077	
Y _{QA} PASS/FAIL by Test Run	Check	PASS	PASS	PASS	PASS
Pitot Tube Coefficient	C _p	0.7617	0.7382	0.7617	
Stack/Duct Static Pressure	in H ₂ O	-13.00	-13.00	-13.00	-13.00
Stack Cross-Sectional Area	ft ²	21.65	21.65	21.65	21.65
Barometric Pressure	in Hg	29.9	29.9	29.9	29.9
Actual Nozzle Diameter	in	0.182	0.168	0.165	
Carbon Dioxide Percentage	% CO ₂	8.2	8.4	8.3	8.3
Oxygen Percentage	% O ₂	11.5	11.4	11.5	11.5
Carbon Monoxide Percentage	% CO	0.0	0.0	0.0	0.0
Nitrogen Percentage	% N ₂	80.3	80.2	80.2	80.2
Total Water Volume Collected	mL	198.5	195.5	192.5	195.5
Sample Volume	ft ³	42.640	42.142	42.232	42.338
Average Meter Temperature	°F	71	76	81	76
Average Stack Temperature	°F	285	285	285	285
Average Delta H	in H ₂ O	0.36	0.36	0.36	0.36
Total Sampling Time	min	126.50	122.50	123.75	124.25

Air Flow Parameters

Volume of Water vapor @ STP	SCF	9.343	9.202	9.061	9.202
Volume Metered @ STP	DSCF	43.189	42.359	42.021	42.523
Absolute Stack/Duct Pressure	in Hg	28.9	28.9	28.9	28.9
Absolute Meter Pressure	in Hg	29.9	29.9	29.9	29.9
Calculated Stack Moisture	% H ₂ O	17.8	17.8	17.7	17.8
Reported Stack Moisture Content	% H ₂ O	17.8	17.8	17.7	17.8
Dry Mole Fraction	decimal	0.822	0.822	0.823	0.822
Avg Differential Pressure (Delta P)	in H ₂ O	1.038	1.153	1.159	1.117
Dry Gas Molecular Weight	lb/lb-mole	29.77	29.80	29.79	29.79
Wet Stack Gas Molecular Weight	lb/lb-mole	27.68	27.69	27.70	27.69
Average Stack Gas Velocity	ft/sec	63.98	65.32	67.56	65.62
Percent of Isokinetic Rate	% ISO	87.4	101.7	100.0	96.4

Air Flow Rate Results

Actual Stack Flow/Minute	ACFM	83,110	84,846	87,766	85,241
Dry Standard Stack Flow/Minute	DSCFM	46,825	47,816	49,516	48,053
Dry Standard Flow/Minute @ 7% O ₂	DSCFM7	31,666	32,680	33,486	32,611

Cyclone Calculations					
Sample Flow Rate at Standard Conds.	Q _{ST}	0.341	0.346	0.340	0.342
Cyclone Flow at Actual Conditons	Q _s	0.606	0.614	0.602	0.607
Flue Gas Viscosity, micropoise	μ	214.9	214.6	214.8	214.8
Reynolds Number	N _{re}	2619	2659	2606	2628
PM 10 Particle Cut Size	D ₅₀	9.89	9.79	9.93	9.87
Cunningham Correction Factor	C	1.088	1.088	1.088	1.088

QA/QC Calculations					
%ISO Results, 80%<I<120%	ISO %	YES	YES	YES	YES
PM10 Cut Size, 9um<D ₅₀ <11um	PM10	YES	YES	YES	YES
% of Catch <10um	%	0.0	25.0	50.0	25.0

Concentration and Emission Rate Data Summary					
Particulate Fraction <10 microns	mg	0.0	0.2	0.5	0.2
Concentration, Gr/DSCF	gr/DSCF	0.00E+00	7.29E-05	1.84E-04	8.55E-05
Concentration, Gr/DSCF @ 7% O ₂	Gr@7%	0.00E+00	1.07E-04	2.72E-04	1.26E-04
Concentration, mg/DSCM	mg/DSCM	0.000	0.167	0.420	0.196
Concentration, mg/DSCM @ 7% O ₂	mg@7%	0.000	0.244	0.621	0.288
Emission Rate, lb/hr	lb/hr	0.000	0.0299	0.0779	0.0359

Particulate Fraction >10 microns	mg	0.6	0.6	0.5	0.6
Concentration, Gr/DSCF	gr/DSCF	2.14E-04	2.19E-04	1.84E-04	2.06E-04
Concentration, Gr/DSCF @ 7% O ₂	Gr@7%	3.17E-04	3.20E-04	2.72E-04	3.03E-04
Concentration, mg/DSCM	mg/DSCM	0.491	0.500	0.420	0.47
Concentration, mg/DSCM @ 7% O ₂	mg@7%	0.725	0.732	0.621	0.69
Emission Rate, lb/hr	lb/hr	0.0860	0.0896	0.0779	0.0845

Total Filterable Particulate	mg	0.6	0.8	1.0	0.8
Concentration, Gr/DSCF	gr/DSCF	2.14E-04	2.91E-04	3.67E-04	2.91E-04
Concentration, Gr/DSCF @ 7% O ₂	Gr@7%	3.17E-04	4.26E-04	5.43E-04	4.29E-04
Concentration, mg/DSCM	mg/DSCM	0.491	0.667	0.840	0.666
Concentration, mg/DSCM @ 7% O ₂	mg@7%	0.725	0.976	1.24	0.981
Emission Rate, lb/hr	lb/hr	0.0860	0.119	0.156	0.120

APPENDIX A.7
Test Results

Unit 1 FF Outlet
Sulfuric Acid Mist

ISOKINETIC SAMPLING TRAIN RESULTS - METHOD:

M8

Client Name	Covanta Energy Group, Inc.	Operator	SGD
Plant Name	Huntington Resource Recovery Facility	Project #	10843
Sampling Location	Unit 1 FF Outlet	Standard Temperature, °F	68

USE IN AVERAGE OF RUN SET? 1 or 0 =>	1	1	1		SET AVERAGE
Run Number		1-O-M8-1	1-O-M8-2	1-O-M8-3	
Run Date		08/28/12	08/28/12	08/28/12	
Run Start Time	hh:mm	900	1144	1445	
Run Stop Time	hh:mm	1003	1248	1547	

Sampling Parameters

Meter Calibration Factor	Y	1.0192	1.0192	1.0192	
Y _{OA} Calculated by Test Run	Y _{OA}	1.0301	1.0204	1.0271	
Y _{OA} PASS/FAIL by Test Run	Check	PASS	PASS	PASS	PASS
Pitot Tube Coefficient	C _p	0.84	0.84	0.84	
Stack/Duct Static Pressure	in H ₂ O	-15.50	-15.70	-15.60	-15.60
Stack Cross-Sectional Area	ft ²	21.648	21.648	21.648	21.648
Barometric Pressure	in Hg	29.7	29.7	29.7	29.7
Actual Nozzle Diameter	in	0.218	0.218	0.218	
Carbon Dioxide Percentage	% CO ₂	8.1	8.3	8.1	8.2
Oxygen Percentage	% O ₂	11.6	11.5	11.6	11.6
Carbon Monoxide Percentage	% CO	0.0	0.0	0.0	0.0
Nitrogen Percentage	% N ₂	80.3	80.2	80.3	80.3
Total Water Volume Collected	mL	149.0	128.5	161.5	146.3
Sample Volume	ft ³	35.450	34.583	35.920	35.318
Average Meter Temperature	°F	81	83	87	84
Average Stack Temperature	°F	285	284	283	284
Average Delta H	in H ₂ O	1.13	1.05	1.14	1.10
Total Sampling Time	min	60	60	60	60

Air Flow Parameters

Volume of Water vapor @ STP	SCF	7.013	6.048	7.602	6.888
Volume Metered @ STP	DSCF	35.110	34.083	35.186	34.793
Absolute Stack/Duct Pressure	in Hg	28.6	28.5	28.6	28.6
Absolute Meter Pressure	in Hg	29.8	29.8	29.8	29.8
Calculated Stack Moisture	% H ₂ O	16.6	15.1	17.8	16.5
Dry Mole Fraction	decimal	0.834	0.849	0.822	0.835
Avg Differential Pressure (Delta P)	in H ₂ O	0.993	0.923	1.002	0.973
Dry Gas Molecular Weight	lb/lb-mole	29.76	29.79	29.76	29.77
Wet Stack Gas Molecular Weight	lb/lb-mole	27.80	28.01	27.67	27.83
Average Stack Gas Velocity	ft/sec	69.28	66.55	69.73	68.52
Percent of Isokinetic Rate	% ISO	96.3	95.5	97.1	96.3

Air Flow Rate Results

Actual Stack Flow/Minute	ACFM	89,985	86,437	90,566	88,996
Dry Standard Stack Flow/Minute	DSCFM	50,774	49,715	50,478	50,322

Concentration and Emission Rate Data Summary

Sulfuric Acid Mist	mg	< 0.120	< 0.088	< 0.123	
Molecular Weight	MW	98.08	98.08	98.08	
Concentration, ppm	ppm	< 0.0296	< 0.0224	< 0.0303	< 0.0274
Concentration @ 12% CO ₂	ppm@12%	< 0.0439	< 0.0323	< 0.0449	< 0.0403
Concentration @ 7% O ₂	ppm@7%	< 0.0442	< 0.0331	< 0.0453	< 0.0409
Emission Rate, lb/hr	lb/hr	< 0.0230	< 0.0170	< 0.0233	< 0.0211

APPENDIX A.8
Test Results

Unit 1 FF Outlet
Total Hydrocarbons as Ethane

CONCENTRATION AND EMISSION RATE DATA SUMMARY

Client Name	Covanta Energy Group, Inc.
Plant Name	Huntington Resource Recovery
Sampling Location	Unit 1 SDA Inlet
Sampling Location	Unit 1 FF Outlet
Operator	10843
Project #	CMW

USE IN AVERAGE OF RUN SET? 1 or 0 =>	1	1	1	
CEM Run Number	1	2	3	
Run Date		08/28/12	08/28/12	08/28/12
Run Start Time	hh:mm	900	939	1015
Run Stop Time	hh:mm	924	1003	1039
Moisture Content	% H ₂ O	16.6	16.6	17.4
Dry Mole Fraction	Mfd	0.834	0.834	0.826
Carbon Dioxide Percentage	% CO ₂	8.130	8.179	8.616
Oxygen Percentage	% O ₂	11.379	11.407	10.915
Dry Standard Stack Flow Rate	DSCFM	50,774	50,774	49,534
Air Flow and Moisture Taken From Test Run =>		1-O-M8-1	1-O-M8-1	1-O-M316-1

Unit 1 FF Outlet					
Total Hydrocarbons (as Ethane)					
Formula Weight	Fwt	30.06	30.06	30.06	
Concentration, ppm (wet)	ppmvw	0.077	0.241	0.323	0.214
Concentration, ppm (dry)	ppmvd	0.064	0.201	0.267	0.177
Concentration, ppm@7%O ₂	ppm@7%O ₂	0.094	0.294	0.371	0.253
Concentration, ppm@12%CO ₂	ppm@12%CO ₂	0.095	0.295	0.372	0.254
Emission Rate, lb/hr	lb/hr	0.0153	0.0478	0.0619	0.0416

CONCENTRATION AND EMISSION RATE DATA SUMMARY

Client Name	Covanta Energy Group, Inc.
Plant Name	Huntington Resource Recovery
Sampling Location	Unit 1 SDA Inlet
Sampling Location	Unit 1 FF Outlet
Operator	10843
Project #	CMW

USE IN AVERAGE OF RUN SET? 1 or 0 =>	1	1	1	
CEM Run Number	4	5	6	
Run Date		08/28/12	08/28/12	08/28/12
Run Start Time	hh:mm	1051	1129	1205
Run Stop Time	hh:mm	1115	1153	1229
Moisture Content	% H ₂ O	17.4	15.1	15.1
Dry Mole Fraction	Mfd	0.826	0.849	0.849
Carbon Dioxide Percentage	% CO ₂	8.034	8.444	8.679
Oxygen Percentage	% O ₂	11.442	11.195	10.991
Dry Standard Stack Flow Rate	DSCFM	49,534	49,715	49,715
Air Flow and Moisture Taken From Test Run =>	1-O-M316-1	1-O-M8-2	1-O-M8-2	

Unit 1 FF Outlet					
Total Hydrocarbons (as Ethane)					
Formula Weight	Fwt	30.06	30.06	30.06	
Concentration, ppm (wet)	ppmvw	0.393	0.451	0.492	0.445
Concentration, ppm (dry)	ppmvd	0.325	0.383	0.418	0.375
Concentration, ppm@7%O ₂	ppm@7%O ₂	0.477	0.548	0.586	0.537
Concentration, ppm@12%CO ₂	ppm@12%CO ₂	0.485	0.544	0.578	0.536
Emission Rate, lb/hr	lb/hr	0.0753	0.0891	0.0972	0.0872

CONCENTRATION AND EMISSION RATE DATA SUMMARY

Client Name	Covanta Energy Group, Inc.
Plant Name	Huntington Resource Recovery
Sampling Location	Unit 1 SDA Inlet
Sampling Location	Unit 1 FF Outlet
Operator	10843
Project #	CMW

USE IN AVERAGE OF RUN SET? 1 or 0 =>		1	1	1	
CEM Run Number		7	8	9	
Run Date		08/28/12	08/28/12	08/28/12	
Run Start Time	hh:mm	1243	1319	1355	SET AVERAGE
Run Stop Time	hh:mm	1307	1343	1419	
Moisture Content	% H ₂ O	15.1	18.0	18.0	17.0
Dry Mole Fraction	Mfd	0.849	0.820	0.820	0.830
Carbon Dioxide Percentage	% CO ₂	8.474	8.308	8.462	8.415
Oxygen Percentage	% O ₂	11.201	11.263	11.143	11.202
Dry Standard Stack Flow Rate	DSCFM	49,715	51,087	51,087	50,630
Air Flow and Moisture Taken From Test Run =>		1-O-M8-2	1-O-M316-2	1-O-M316-2	

Unit 1 FF Outlet					
Total Hydrocarbons (as Ethane)					
Formula Weight	Fwt	30.06	30.06	30.06	
Concentration, ppm (wet)	ppmvw	0.519	0.490	0.453	0.487
Concentration, ppm (dry)	ppmvd	0.441	0.402	0.371	0.405
Concentration, ppm@7%O₂	ppm@7%O ₂	0.631	0.580	0.529	0.580
Concentration, ppm@12%CO₂	ppm@12%CO ₂	0.624	0.580	0.527	0.577
Emission Rate, lb/hr	lb/hr	0.103	0.0961	0.0888	0.0958

CONCENTRATION AND EMISSION RATE DATA SUMMARY

Client Name	Covanta Energy Group, Inc.
Plant Name	Huntington Resource Recovery
Sampling Location	Unit 1 SDA Inlet
Sampling Location	Unit 1 FF Outlet
Operator	10843
Project #	CMW

Repetition Number	1	2	3
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Unit 1 FF Outlet					
Total Hydrocarbons (as Ethane)					
Concentration, ppm (wet)	ppmvw	0.214	0.445	0.487	0.382
Concentration, ppm (dry)	ppmvd	0.177	0.375	0.405	0.319
Concentration, ppm@7%O2	ppm@7%O2	0.253	0.537	0.580	0.457
Concentration, ppm@12%CO2	ppm@12%CO2	0.254	0.536	0.577	0.455
Emission Rate, lb/hr	lb/hr	0.0416	0.0872	0.0958	0.0749

APPENDIX A.9
Test Results

Unit 2 SDA Inlet
Hydrogen Chloride

ISOKINETIC SAMPLING TRAIN RESULTS - METHOD:

MM26

Client Name	Covanta Energy Group, Inc.	Operator	CAN
Plant Name	Huntington Resource Recovery Facility	Project #	10843
Sampling Location	Unit 2 SDA Inlet	Standard Temperature, °F	68

USE IN AVERAGE OF RUN SET? 1 or 0 =>	1	1	1	SET AVERAGE
Run Number	2-I-MM26-1	2-I-MM26-2	2-I-MM26-3	
Run Date	09/06/12	09/06/12	09/06/12	
Run Start Time	hh:mm	845	1114	
Run Stop Time	hh:mm	954	1223	1450

Sampling Parameters

Meter Calibration Factor	Y	1.0029	1.0029	1.0029	
Y _{QA} Calculated by Test Run	Y _{QA}	1.0434	1.0364	1.0284	
Y _{QA} PASS/FAIL by Test Run	Check	PASS	PASS	PASS	PASS
Pitot Tube Coefficient	C _p	0.84	0.84	0.84	
Stack/Duct Static Pressure	in H ₂ O	-2.60	-2.60	-2.60	-2.60
Barometric Pressure	in Hg	29.8	29.8	29.8	29.8
Carbon Dioxide Percentage	% CO ₂	10.0	9.9	9.3	9.7
Oxygen Percentage	% O ₂	9.6	9.7	10.4	9.9
Carbon Monoxide Percentage	% CO	0.0	0.0	0.0	0.0
Nitrogen Percentage	% N ₂	80.4	80.4	80.3	80.4
Total Water Volume Collected	mL	169.4	162.1	163.4	165.0
Sample Volume	ft ³	38.548	38.830	39.232	38.870
Average Meter Temperature	°F	83	83	85	83
Average Delta H	in H ₂ O	1.40	1.40	1.40	1.40
Total Sampling Time	min	60	60	60	60

Air Flow Parameters

Volume of Water vapor @ STP	SCF	7.974	7.630	7.691	7.765
Volume Metered @ STP	DSCF	37.590	37.836	38.116	37.847
Absolute Stack/Duct Pressure	in Hg	29.6	29.6	29.6	29.6
Absolute Meter Pressure	in Hg	29.9	29.9	29.9	29.9
Calculated Stack Moisture	% H ₂ O	17.5	16.8	16.8	17.0

Concentration and Emission Rate Data Summary

Hydrogen Chloride	mg	803	633	1380	
Molecular Weight	MW	36.46	36.46	36.46	
Concentration, ppm	ppm	498	390	843	577
Concentration @ 12% CO ₂	ppm@12%	597	472	1088	719
Concentration @ 7% O ₂	ppm@7%	612	484	1117	738

APPENDIX A.10
Test Results

Unit 2 SDA Inlet
Mercury

ISOKINETIC SAMPLING TRAIN RESULTS - METHOD

M29

Client Name	Covanta Energy Group, Inc.	Operator	CAN
Plant Name	Huntington Resource Recovery Facility	Project #	10843
Sampling Location	Unit 2 SDA Inlet	Standard Temperature, °F	68

USE IN AVERAGE OF RUN SET? 1 or 0 =>	1	1	1	SET AVERAGE
Run Number	2-I-M29-1	2-I-M29-2	2-I-M29-3	
Run Date	09/06/12	09/06/12	09/06/12	
Run Start Time	hh:mm	814	1043	
Run Stop Time	hh:mm	1024	1257	1521

Sampling Parameters

Meter Calibration Factor	Y	1.0108	1.0108	1.0108	
Y _{OA} Calculated by Test Run	Y _{OA}	0.9850	0.9713	0.9853	
Y _{OA} PASS/FAIL by Test Run	Check	PASS	PASS	PASS	PASS
Pitot Tube Coefficient	C _p	0.84	0.84	0.84	
Stack/Duct Static Pressure	in H ₂ O	-2.60	-2.60	-2.60	-2.60
Stack Cross-Sectional Area	ft ²	23.758	23.758	23.758	23.758
Barometric Pressure	in Hg	29.8	29.8	29.8	29.8
Actual Nozzle Diameter	in	0.236	0.234	0.236	
Carbon Dioxide Percentage	% CO ₂	10.0	9.9	9.3	9.7
Oxygen Percentage	% O ₂	9.6	9.7	10.4	9.9
Carbon Monoxide Percentage	% CO	0.0	0.0	0.0	0.0
Nitrogen Percentage	% N ₂	80.4	80.4	80.3	80.4
Total Water Volume Collected	mL	267.9	256.1	249.6	257.9
Sample Volume	ft ³	60.107	60.232	60.390	60.243
Average Meter Temperature	°F	84	83	86	84
Average Stack Temperature	°F	422	425	428	425
Average Delta H	in H ₂ O	0.71	0.69	0.71	0.71
Total Sampling Time	min	120	120	120	120

Air Flow Parameters

Volume of Water vapor @ STP	SCF	12.610	12.055	11.749	12.138
Volume Metered @ STP	DSCF	58.866	59.022	58.909	58.933
Absolute Stack/Duct Pressure	in Hg	29.6	29.6	29.6	29.6
Absolute Meter Pressure	in Hg	29.9	29.9	29.9	29.9
Calculated Stack Moisture	% H ₂ O	17.6	17.0	16.6	17.1
Dry Mole Fraction	decimal	0.824	0.830	0.834	0.829
Avg Differential Pressure (Delta P)	in H ₂ O	0.545	0.539	0.540	0.541
Dry Gas Molecular Weight	lb/lb-mole	29.98	29.97	29.90	29.95
Wet Stack Gas Molecular Weight	lb/lb-mole	27.87	27.94	27.92	27.91
Average Stack Gas Velocity	ft/sec	54.81	54.53	54.71	54.68
Percent of Isokinetic Rate	% ISO	100.7	102.8	100.4	101.3

Air Flow Rate Results

Actual Stack Flow/Minute	ACFM	78,137	77,725	77,981	77,948
Dry Standard Stack Flow/Minute	DSCFM	38,130	38,096	38,250	38,159

Concentration and Emission Rate Data Summary

Mercury (Hg)	ug	< 87.700	< 66.578	< 84.038	< 79.438
Concentration ug/DSCM	ug/DSCM	< 52.6	< 39.8	< 50.4	< 47.6
Concentration ug @ 12% CO ₂	ug@12%	< 63.1	< 48.3	< 65.0	< 58.8
Concentration ug @ 7% O ₂	ug@7%	< 64.7	< 49.4	< 66.7	< 60.3
Emission Rate, lb/hr	lb/hr	< 7.51E-03	< 5.68E-03	< 7.22E-03	< 6.81E-03

APPENDIX A.11
Test Results

Unit 2 FF Outlet
Ammonia, Hydrogen Chloride, and Hydrogen Fluoride

ISOKINETIC SAMPLING TRAIN RESULTS - METHOD:

M26A

Client Name	Covanta Energy Group, Inc.	Operator	SGD
Plant Name	Huntington Resource Recovery Facility	Project #	10843
Sampling Location	Unit 2 FF Outlet	Standard Temperature, °F	68

USE IN AVERAGE OF RUN SET? 1 or 0 =>	1	1	1	SET AVERAGE
Run Number	2-O-M26A-1	2-O-M26A-2	2-O-M26A-3	
Run Date	09/06/12	09/06/12	09/06/12	
Run Start Time	hh:mm	845	1114	
Run Stop Time	hh:mm	954	1223	1450

Sampling Parameters

Meter Calibration Factor	Y	1.0192	1.0192	1.0192	
Y_{QA} Calculated by Test Run	Y _{QA}	1.0092	1.0239	1.0133	
Y_{QA} PASS/FAIL by Test Run	Check	PASS	PASS	PASS	PASS
Pitot Tube Coefficient	C _p	0.84	0.84	0.84	
Stack/Duct Static Pressure	in H ₂ O	-15.50	-15.50	-15.40	-15.47
Stack Cross-Sectional Area	ft ²	21.648	21.648	21.648	21.648
Barometric Pressure	in Hg	29.8	29.8	29.8	29.8
Actual Nozzle Diameter	in	0.218	0.220	0.218	
Carbon Dioxide Percentage	% CO ₂	8.9	8.5	8.4	8.6
Oxygen Percentage	% O ₂	10.9	11.1	11.3	11.1
Carbon Monoxide Percentage	% CO	0.0	0.0	0.0	0.0
Nitrogen Percentage	% N ₂	80.2	80.4	80.3	80.3
Total Water Volume Collected	mL	166.8	164.9	156.2	162.6
Sample Volume	ft ³	33.983	33.785	32.572	33.447
Average Meter Temperature	°F	79	82	84	81
Average Stack Temperature	°F	278	278	279	278
Average Delta H	in H ₂ O	1.00	1.02	0.93	0.98
Total Sampling Time	min	60	60	60	60

Air Flow Parameters

Volume of Water vapor @ STP	SCF	7.851	7.762	7.352	7.655
Volume Metered @ STP	DSCF	33.885	33.499	32.166	33.183
Absolute Stack/Duct Pressure	in Hg	28.7	28.7	28.7	28.7
Absolute Meter Pressure	in Hg	29.9	29.9	29.9	29.9
Calculated Stack Moisture	% H ₂ O	18.8	18.8	18.6	18.7
Saturated Stack Moisture	% H ₂ O	100.0	100.0	100.0	100.0
Reported Stack Moisture Content	% H ₂ O	18.8	18.8	18.6	18.7
Dry Mole Fraction	decimal	0.812	0.812	0.814	0.813
Avg Differential Pressure (Delta P)	in H ₂ O	0.885	0.862	0.809	0.852
Dry Gas Molecular Weight	lb/lb-mole	29.86	29.80	29.80	29.82
Wet Stack Gas Molecular Weight	lb/lb-mole	27.63	27.58	27.60	27.60
Average Stack Gas Velocity	ft/sec	65.20	64.41	62.43	64.01
Percent of Isokinetic Rate	% ISO	100.1	98.4	99.1	99.2

Air Flow Rate Results

Actual Stack Flow/Minute	ACFM	84,693	83,655	81,090	83,146
Dry Standard Stack Flow/Minute	DSCFM	47,142	46,541	45,189	46,291

Concentration and Emission Rate Data Summary					
Hydrogen Chloride	mg	1.77	1.19	1.63	
Molecular Weight	MW	36.46	36.46	36.46	
Concentration, ppm	ppm	1.22	0.83	1.18	1.08
Concentration @ 12% CO ₂	ppm@12%	1.64	1.17	1.69	1.50
Concentration @ 7% O ₂	ppm@7%	1.69	1.17	1.71	1.52
Emission Rate, lb/hr	lb/hr	0.326	0.219	0.303	0.282
Ammonia	mg	4.23	7.97	3.97	
Molecular Weight	MW	17.01	17.01	17.01	
Concentration, ppm	ppm	6.23	11.9	6.16	8.09
Concentration @ 12% CO ₂	ppm@12%	8.41	16.8	8.80	11.3
Concentration @ 7% O ₂	ppm@7%	8.67	16.9	8.92	11.5
Emission Rate, lb/hr	lb/hr	0.778	1.46	0.738	0.994
Hydrogen Fluoride as HF	mg	< 0.096	< 0.096	< 0.096	
Molecular Weight	MW	20.01	20.01	20.01	
Concentration, ppm	ppm	< 0.120	< 0.122	< 0.127	< 0.123
Concentration @ 12% CO ₂	ppm@12%	< 0.162	< 0.172	< 0.181	< 0.172
Concentration @ 7% O ₂	ppm@7%	< 0.167	< 0.173	< 0.183	< 0.174
Emission Rate, lb/hr	lb/hr	< 0.0177	< 0.0176	< 0.0178	< 0.0177

Removal Efficiency Summary For:

HCl

Unit #	Repetition Number	ppm @ 7 % O2		Removal Efficiency, %
		Inlet Result	Outlet Result	
2	1	612	1.69	99.7%
	2	484	1.17	99.8%
	3	1117	1.71	99.8%
AVERAGE =>				99.8%

APPENDIX A.12
Test Results

Unit 2 FF Outlet
Dioxins/Furans, PAHS, and PCBS

ISOKINETIC SAMPLING TRAIN RESULTS - METHOD

23

Client Name	Covanta Energy Group, Inc.	Operator	CAN
Plant Name	Huntington Resource Recovery Facility	Project #	10843
Sampling Location	Unit 2 FF Outlet	Standard Temperature, °F	68

USE IN AVERAGE OF RUN SET? 1 or 0 =>	1	1	1	SET AVERAGE
Run Number		2-O-M23-1	2-O-M23-2	
Run Date		08/28/12	08/30/12	
Run Start Time	hh:mm	1333	756	
Run Stop Time	hh:mm	1814	1159	1610

Sampling Parameters

Meter Calibration Factor	Y	1.0176	1.0065	1.0176	
Y _{QA} Calculated by Test Run	Y _{QA}	0.9795	1.0013	1.0038	
Y _{QA} PASS/FAIL by Test Run	Check	PASS	PASS	PASS	PASS
Pitot Tube Coefficient	C _p	0.84	0.84	0.84	
Stack/Duct Static Pressure	in H ₂ O	-15.00	-15.00	-15.00	-15.00
Stack Cross-Sectional Area	ft ²	21.648	21.648	21.648	21.648
Barometric Pressure	in Hg	29.7	29.9	29.9	29.8
Actual Nozzle Diameter	in	0.197	0.218	0.218	
Carbon Dioxide Percentage	% CO ₂	9.3	8.6	8.4	8.8
Oxygen Percentage	% O ₂	10.5	11.2	11.3	11.0
Carbon Monoxide Percentage	% CO	0.0	0.0	0.0	0.0
Nitrogen Percentage	% N ₂	80.2	80.2	80.3	80.2
Total Water Volume Collected	mL	459.5	567.0	573.5	533.3
Sample Volume	ft ³	106.479	129.473	137.155	124.369
Average Meter Temperature	°F	88	75	83	82
Average Stack Temperature	°F	278	276	278	277
Average Delta H	in H ₂ O	0.56	1.01	0.99	0.85
Total Sampling Time	min	240	240	240	240

Air Flow Parameters

Volume of Water vapor @ STP	SCF	21.629	26.689	26.995	25.104
Volume Metered @ STP	DSCF	103.771	128.891	135.934	122.866
Absolute Stack/Duct Pressure	in Hg	28.6	28.8	28.8	28.7
Absolute Meter Pressure	in Hg	29.7	30.0	30.0	29.9
Calculated Stack Moisture	% H ₂ O	17.2	17.2	16.6	17.0
Saturated Stack Moisture	% H ₂ O	100.0	100.0	100.0	100.0
Reported Stack Moisture Content	% H ₂ O	17.2	17.2	16.6	17.0
Dry Mole Fraction	decimal	0.828	0.828	0.834	0.830
Avg Differential Press. (Delta P)	in H ₂ O	0.753	0.796	0.883	0.811
Dry Gas Molecular Weight	lb/lb-mole	29.91	29.82	29.80	29.84
Wet Stack Gas Molecular Weight	lb/lb-mole	27.85	27.80	27.84	27.83
Average Stack Gas Velocity	ft/sec	59.98	61.44	64.75	62.05
Percent of Isokinetic Rate	% ISO	100.4	98.3	97.9	98.9

Air Flow Rate Results

Actual Stack Flow/Minute	ACFM	77,907	79,799	84,098	80,601
Dry Standard Stack Flow/Minute	DSCFM	44,063	45,670	48,334	46,022

* In accordance with EPA Method 23, Section 9.9, results below the minimum detection limit were treated as zero when averaging or totaling the results. 68°F and 29.92 inches Hg

Concentration and Emission Rate Data Summary					
2,3,7,8-TCDD	pg	0.0	0.0	3.6	1.2
Concentration, ng/DSCM	ng/DSCM	0.00E+00	0.00E+00	9.33E-04	3.11E-04
Concen., ng/DSCM @ 12% CO ₂	ng@12%	0.00E+00	0.00E+00	1.33E-03	4.44E-04
Concen., ng/DSCM @ 7% O ₂	ng@7%	0.00E+00	0.00E+00	1.35E-03	4.50E-04
Emission Rate, lb/hr	lb/hr	0.00E+00	0.00E+00	1.69E-10	5.63E-11
Emission Rate, grams/second	g/s	0.00E+00	0.00E+00	2.13E-11	7.09E-12
Other TCDD	pg	32.2	34.3	162.4	76.3
Concentration, ng/DSCM	ng/DSCM	1.10E-02	9.40E-03	4.22E-02	2.08E-02
Concen., ng/DSCM @ 12% CO ₂	ng@12%	1.41E-02	1.31E-02	6.03E-02	2.92E-02
Concen., ng/DSCM @ 7% O ₂	ng@7%	1.46E-02	1.35E-02	6.11E-02	2.97E-02
Emission Rate, lb/hr	lb/hr	1.81E-09	1.61E-09	7.64E-09	3.68E-09
Emission Rate, grams/second	g/s	2.28E-10	2.03E-10	9.62E-10	4.64E-10
1,2,3,7,8-PeCDD	pg	4.6	4.4	11.6	6.9
Concentration, ng/DSCM	ng/DSCM	1.58E-03	1.19E-03	3.01E-03	1.93E-03
Concen., ng/DSCM @ 12% CO ₂	ng@12%	2.03E-03	1.66E-03	4.30E-03	2.67E-03
Concen., ng/DSCM @ 7% O ₂	ng@7%	2.11E-03	1.71E-03	4.36E-03	2.73E-03
Emission Rate, lb/hr	lb/hr	2.60E-10	2.04E-10	5.46E-10	3.37E-10
Emission Rate, grams/second	g/s	3.28E-11	2.57E-11	6.87E-11	4.24E-11
Other PeCDD	pg	51.8	68.6	250.4	123.6
Concentration, ng/DSCM	ng/DSCM	1.76E-02	1.88E-02	6.50E-02	3.38E-02
Concen., ng/DSCM @ 12% CO ₂	ng@12%	2.27E-02	2.62E-02	9.29E-02	4.73E-02
Concen., ng/DSCM @ 7% O ₂	ng@7%	2.35E-02	2.69E-02	9.42E-02	4.82E-02
Emission Rate, lb/hr	lb/hr	2.91E-09	3.21E-09	1.18E-08	5.97E-09
Emission Rate, grams/second	g/s	3.66E-10	4.05E-10	1.48E-09	7.52E-10
1,2,3,4,7,8-HxCDD	pg	5.3	0.0	12.8	6.0
Concentration, ng/DSCM	ng/DSCM	1.81E-03	0.00E+00	3.32E-03	1.71E-03
Concen., ng/DSCM @ 12% CO ₂	ng@12%	2.34E-03	0.00E+00	4.75E-03	2.36E-03
Concen., ng/DSCM @ 7% O ₂	ng@7%	2.42E-03	0.00E+00	4.81E-03	2.41E-03
Emission Rate, lb/hr	lb/hr	2.99E-10	0.00E+00	6.02E-10	3.00E-10
Emission Rate, grams/second	g/s	3.76E-11	0.00E+00	7.59E-11	3.78E-11
1,2,3,6,7,8-HxCDD	pg	10.7	6.2	40.2	19.0
Concentration, ng/DSCM	ng/DSCM	3.64E-03	1.69E-03	1.04E-02	5.26E-03
Concen., ng/DSCM @ 12% CO ₂	ng@12%	4.70E-03	2.36E-03	1.49E-02	7.33E-03
Concen., ng/DSCM @ 7% O ₂	ng@7%	4.87E-03	2.43E-03	1.51E-02	7.47E-03
Emission Rate, lb/hr	lb/hr	6.01E-10	2.90E-10	1.89E-09	9.27E-10
Emission Rate, grams/second	g/s	7.57E-11	3.65E-11	2.38E-10	1.17E-10
1,2,3,7,8,9-HxCDD	pg	9.4	0.0	24.0	11.1
Concentration, ng/DSCM	ng/DSCM	3.21E-03	0.00E+00	6.23E-03	3.15E-03
Concen., ng/DSCM @ 12% CO ₂	ng@12%	4.14E-03	0.00E+00	8.91E-03	4.35E-03
Concen., ng/DSCM @ 7% O ₂	ng@7%	4.29E-03	0.00E+00	9.03E-03	4.44E-03
Emission Rate, lb/hr	lb/hr	5.30E-10	0.00E+00	1.13E-09	5.53E-10
Emission Rate, grams/second	g/s	6.68E-11	0.00E+00	1.42E-10	6.97E-11

* In accordance with EPA Method 23, Section 9.9, results below the minimum detection limit were treated as zero when averaging or totaling the results. 68oF and 29.92 inches Hg

Other HxCDD	pg	111.5	94.8	478.0		228.1
Concentration, ng/DSCM	ng/DSCM	3.80E-02	2.60E-02	1.24E-01		6.27E-02
Concen., ng/DSCM @ 12% CO ₂	ng@12%	4.90E-02	3.62E-02	1.77E-01		8.75E-02
Concen., ng/DSCM @ 7% O ₂	ng@7%	5.07E-02	3.72E-02	1.80E-01		8.92E-02
Emission Rate, lb/hr	lb/hr	6.26E-09	4.44E-09	2.25E-08		1.11E-08
Emission Rate, grams/second	g/s	7.89E-10	5.60E-10	2.83E-09		1.39E-09
1,2,3,4,6,7,8-HpCDD	pg	67.1	62.9	234.0		121.3
Concentration, ng/DSCM	ng/DSCM	2.28E-02	1.72E-02	6.08E-02		3.36E-02
Concen., ng/DSCM @ 12% CO ₂	ng@12%	2.95E-02	2.40E-02	8.68E-02		4.68E-02
Concen., ng/DSCM @ 7% O ₂	ng@7%	3.05E-02	2.47E-02	8.80E-02		4.77E-02
Emission Rate, lb/hr	lb/hr	3.77E-09	2.95E-09	1.10E-08		5.91E-09
Emission Rate, grams/second	g/s	4.75E-10	3.71E-10	1.39E-09		7.44E-10
Other HpCDD	pg	73.9	57.1	243.0		124.7
Concentration, ng/DSCM	ng/DSCM	2.51E-02	1.56E-02	6.31E-02		3.46E-02
Concen., ng/DSCM @ 12% CO ₂	ng@12%	3.24E-02	2.18E-02	9.02E-02		4.81E-02
Concen., ng/DSCM @ 7% O ₂	ng@7%	3.36E-02	2.24E-02	9.14E-02		4.91E-02
Emission Rate, lb/hr	lb/hr	4.15E-09	2.68E-09	1.14E-08		6.09E-09
Emission Rate, grams/second	g/s	5.23E-10	3.37E-10	1.44E-09		7.67E-10
OCDD	pg	133.0	96.1	363.0		197.4
Concentration, ng/DSCM	ng/DSCM	4.53E-02	2.63E-02	9.43E-02		5.53E-02
Concen., ng/DSCM @ 12% CO ₂	ng@12%	5.84E-02	3.67E-02	1.35E-01		7.66E-02
Concen., ng/DSCM @ 7% O ₂	ng@7%	6.05E-02	3.77E-02	1.37E-01		7.82E-02
Emission Rate, lb/hr	lb/hr	7.47E-09	4.50E-09	1.71E-08		9.68E-09
Emission Rate, grams/second	g/s	9.41E-10	5.68E-10	2.15E-09		1.22E-09
2,3,7,8-TCDF	pg	11.8	8.0	22.0		13.9
Concentration, ng/DSCM	ng/DSCM	4.02E-03	2.18E-03	5.71E-03		3.97E-03
Concen., ng/DSCM @ 12% CO ₂	ng@12%	5.18E-03	3.04E-03	8.16E-03		5.46E-03
Concen., ng/DSCM @ 7% O ₂	ng@7%	5.37E-03	3.12E-03	8.27E-03		5.59E-03
Emission Rate, lb/hr	lb/hr	6.63E-10	3.73E-10	1.03E-09		6.90E-10
Emission Rate, grams/second	g/s	8.35E-11	4.70E-11	1.30E-10		8.70E-11
Other TCDF	pg	201.2	174.0	646.0		340.4
Concentration, ng/DSCM	ng/DSCM	6.85E-02	4.77E-02	1.68E-01		9.46E-02
Concen., ng/DSCM @ 12% CO ₂	ng@12%	8.83E-02	6.65E-02	2.40E-01		1.32E-01
Concen., ng/DSCM @ 7% O ₂	ng@7%	9.15E-02	6.83E-02	2.43E-01		1.34E-01
Emission Rate, lb/hr	lb/hr	1.13E-08	8.16E-09	3.04E-08		1.66E-08
Emission Rate, grams/second	g/s	1.42E-09	1.03E-09	3.83E-09		2.09E-09
1,2,3,7,8-PeCDF	pg	14.2	13.2	36.8		21.4
Concentration, ng/DSCM	ng/DSCM	4.83E-03	3.62E-03	9.56E-03		6.00E-03
Concen., ng/DSCM @ 12% CO ₂	ng@12%	6.23E-03	5.05E-03	1.37E-02		8.31E-03
Concen., ng/DSCM @ 7% O ₂	ng@7%	6.46E-03	5.18E-03	1.38E-02		8.49E-03
Emission Rate, lb/hr	lb/hr	7.98E-10	6.19E-10	1.73E-09		1.05E-09
Emission Rate, grams/second	g/s	1.00E-10	7.80E-11	2.18E-10		1.32E-10

* In accordance with EPA Method 23, Section 9.9, results below the minimum detection limit were treated as zero when averaging or totaling the results. 68oF and 29.92 inches Hg

2,3,4,7,8-PeCDF	pg	20.6	12.1	41.2	24.6
Concentration, ng/DSCM	ng/DSCM	7.01E-03	3.31E-03	1.07E-02	7.01E-03
Concen., ng/DSCM @ 12% CO ₂	ng@12%	9.04E-03	4.63E-03	1.53E-02	9.65E-03
Concen., ng/DSCM @ 7% O ₂	ng@7%	9.37E-03	4.75E-03	1.55E-02	9.87E-03
Emission Rate, lb/hr	lb/hr	1.16E-09	5.67E-10	1.94E-09	1.22E-09
Emission Rate, grams/second	g/s	1.46E-10	7.15E-11	2.44E-10	1.54E-10

Other PeCDF	pg	169.2	114.7	383.0	222.3
Concentration, ng/DSCM	ng/DSCM	5.76E-02	3.14E-02	9.95E-02	6.28E-02
Concen., ng/DSCM @ 12% CO ₂	ng@12%	7.43E-02	4.38E-02	1.42E-01	8.68E-02
Concen., ng/DSCM @ 7% O ₂	ng@7%	7.69E-02	4.50E-02	1.44E-01	8.87E-02
Emission Rate, lb/hr	lb/hr	9.50E-09	5.38E-09	1.80E-08	1.10E-08
Emission Rate, grams/second	g/s	1.20E-09	6.77E-10	2.27E-09	1.38E-09

1,2,3,4,7,8-HxCDF	pg	19.8	13.6	32.6	22.0
Concentration, ng/DSCM	ng/DSCM	6.74E-03	3.73E-03	8.47E-03	6.31E-03
Concen., ng/DSCM @ 12% CO ₂	ng@12%	8.69E-03	5.20E-03	1.21E-02	8.66E-03
Concen., ng/DSCM @ 7% O ₂	ng@7%	9.00E-03	5.34E-03	1.23E-02	8.87E-03
Emission Rate, lb/hr	lb/hr	1.11E-09	6.37E-10	1.53E-09	1.09E-09
Emission Rate, grams/second	g/s	1.40E-10	8.03E-11	1.93E-10	1.38E-10

1,2,3,6,7,8-HxCDF	pg	23.1	14.2	45.9	27.7
Concentration, ng/DSCM	ng/DSCM	7.86E-03	3.89E-03	1.19E-02	7.89E-03
Concen., ng/DSCM @ 12% CO ₂	ng@12%	1.01E-02	5.43E-03	1.70E-02	1.09E-02
Concen., ng/DSCM @ 7% O ₂	ng@7%	1.05E-02	5.57E-03	1.73E-02	1.11E-02
Emission Rate, lb/hr	lb/hr	1.30E-09	6.66E-10	2.16E-09	1.37E-09
Emission Rate, grams/second	g/s	1.63E-10	8.39E-11	2.72E-10	1.73E-10

2,3,4,6,7,8-HxCDF	pg	18.0	13.7	40.9	24.2
Concentration, ng/DSCM	ng/DSCM	6.12E-03	3.75E-03	1.06E-02	6.83E-03
Concen., ng/DSCM @ 12% CO ₂	ng@12%	7.90E-03	5.24E-03	1.52E-02	9.44E-03
Concen., ng/DSCM @ 7% O ₂	ng@7%	8.19E-03	5.38E-03	1.54E-02	9.65E-03
Emission Rate, lb/hr	lb/hr	1.01E-09	6.42E-10	1.92E-09	1.19E-09
Emission Rate, grams/second	g/s	1.27E-10	8.09E-11	2.42E-10	1.50E-10

1,2,3,7,8,9-HxCDF	pg	0.0	0.0	0.0	0.0
Concentration, ng/DSCM	ng/DSCM	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Concen., ng/DSCM @ 12% CO ₂	ng@12%	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Concen., ng/DSCM @ 7% O ₂	ng@7%	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Emission Rate, lb/hr	lb/hr	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Emission Rate, grams/second	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Other HxCDF	pg	84.1	53.1	167.6	101.6
Concentration, ng/DSCM	ng/DSCM	2.86E-02	1.45E-02	4.35E-02	2.89E-02
Concen., ng/DSCM @ 12% CO ₂	ng@12%	3.69E-02	2.03E-02	6.22E-02	3.98E-02
Concen., ng/DSCM @ 7% O ₂	ng@7%	3.82E-02	2.08E-02	6.30E-02	4.07E-02
Emission Rate, lb/hr	lb/hr	4.72E-09	2.49E-09	7.88E-09	5.03E-09
Emission Rate, grams/second	g/s	5.95E-10	3.14E-10	9.93E-10	6.34E-10

* In accordance with EPA Method 23, Section 9.9, results below the minimum detection limit were treated as zero when averaging or totaling the results. 68oF and 29.92 inches Hg

1,2,3,4,6,7,8-HpCDF	pg	59.0	34.6	88.4		60.7
Concentration, ng/DSCM	ng/DSCM	2.01E-02	9.48E-03	2.30E-02		1.75E-02
Concen., ng/DSCM @ 12% CO ₂	ng@12%	2.59E-02	1.32E-02	3.28E-02		2.40E-02
Concen., ng/DSCM @ 7% O ₂	ng@7%	2.68E-02	1.36E-02	3.32E-02		2.46E-02
Emission Rate, lb/hr	lb/hr	3.31E-09	1.62E-09	4.16E-09		3.03E-09
Emission Rate, grams/second	g/s	4.18E-10	2.04E-10	5.24E-10		3.82E-10

1,2,3,4,7,8,9-HpCDF	pg	6.1	6.5	7.8		6.8
Concentration, ng/DSCM	ng/DSCM	2.09E-03	1.78E-03	2.03E-03		1.97E-03
Concen., ng/DSCM @ 12% CO ₂	ng@12%	2.70E-03	2.48E-03	2.90E-03		2.69E-03
Concen., ng/DSCM @ 7% O ₂	ng@7%	2.79E-03	2.55E-03	2.94E-03		2.76E-03
Emission Rate, lb/hr	lb/hr	3.45E-10	3.04E-10	3.68E-10		3.39E-10
Emission Rate, grams/second	g/s	4.35E-11	3.83E-11	4.63E-11		4.27E-11

Other HpCDF	pg	19.5	17.0	26.8		21.1
Concentration, ng/DSCM	ng/DSCM	6.62E-03	4.66E-03	6.96E-03		6.08E-03
Concen., ng/DSCM @ 12% CO ₂	ng@12%	8.54E-03	6.50E-03	9.94E-03		8.33E-03
Concen., ng/DSCM @ 7% O ₂	ng@7%	8.85E-03	6.68E-03	1.01E-02		8.53E-03
Emission Rate, lb/hr	lb/hr	1.09E-09	7.97E-10	1.26E-09		1.05E-09
Emission Rate, grams/second	g/s	1.38E-10	1.00E-10	1.59E-10		1.32E-10

OCDF	pg	24.0	17.6	27.7		23.1
Concentration, ng/DSCM	ng/DSCM	8.17E-03	4.82E-03	7.20E-03		6.73E-03
Concen., ng/DSCM @ 12% CO ₂	ng@12%	1.05E-02	6.73E-03	1.03E-02		9.18E-03
Concen., ng/DSCM @ 7% O ₂	ng@7%	1.09E-02	6.91E-03	1.04E-02		9.41E-03
Emission Rate, lb/hr	lb/hr	1.35E-09	8.25E-10	1.30E-09		1.16E-09
Emission Rate, grams/second	g/s	1.70E-10	1.04E-10	1.64E-10		1.46E-10

* In accordance with EPA Method 23, Section 9.9, results below the minimum detection limit were treated as zero when averaging or totaling the results. 68oF and 29.92 inches Hg

Unit 2 FF Outlet
Concentration and Emission Rate Summary
Run Number: 2-O-M23-1

Congener	UNITY	Concentration			Emission Rate	
		ng/DSCM	ng@12%	ng@7%	lb/hr	grams/sec
2,3,7,8-TCDD	1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Other TCDD	1	1.10E-02	1.41E-02	1.46E-02	1.81E-09	2.28E-10
1,2,3,7,8-PeCDD	1	1.58E-03	2.03E-03	2.11E-03	2.60E-10	3.28E-11
Other PeCDD	1	1.76E-02	2.27E-02	2.35E-02	2.91E-09	3.66E-10
1,2,3,4,7,8-HxCDD	1	1.81E-03	2.34E-03	2.42E-03	2.99E-10	3.76E-11
1,2,3,6,7,8-HxCDD	1	3.64E-03	4.70E-03	4.87E-03	6.01E-10	7.57E-11
1,2,3,7,8,9-HxCDD	1	3.21E-03	4.14E-03	4.29E-03	5.30E-10	6.68E-11
Other HxCDD	1	3.80E-02	4.90E-02	5.07E-02	6.26E-09	7.89E-10
1,2,3,4,6,7,8-HpCDD	1	2.28E-02	2.95E-02	3.05E-02	3.77E-09	4.75E-10
Other HpCDD	1	2.51E-02	3.24E-02	3.36E-02	4.15E-09	5.23E-10
OCDD	1	4.53E-02	5.84E-02	6.05E-02	7.47E-09	9.41E-10
TOTAL PCDD		1.70E-01	2.19E-01	2.27E-01	2.81E-08	3.54E-09
2,3,7,8-TCDF	1	4.02E-03	5.18E-03	5.37E-03	6.63E-10	8.35E-11
Other TCDF	1	6.85E-02	8.83E-02	9.15E-02	1.13E-08	1.42E-09
1,2,3,7,8-PeCDF	1	4.83E-03	6.23E-03	6.46E-03	7.98E-10	1.00E-10
2,3,4,7,8-PeCDF	1	7.01E-03	9.04E-03	9.37E-03	1.16E-09	1.46E-10
Other PeCDF	1	5.76E-02	7.43E-02	7.69E-02	9.50E-09	1.20E-09
1,2,3,4,7,8-HxCDF	1	6.74E-03	8.69E-03	9.00E-03	1.11E-09	1.40E-10
1,2,3,6,7,8-HxCDF	1	7.86E-03	1.01E-02	1.05E-02	1.30E-09	1.63E-10
2,3,4,6,7,8-HxCDF	1	6.12E-03	7.90E-03	8.19E-03	1.01E-09	1.27E-10
1,2,3,7,8,9-HxCDF	1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Other HxCDF	1	2.86E-02	3.69E-02	3.82E-02	4.72E-09	5.95E-10
1,2,3,4,6,7,8-HpCDF	1	2.01E-02	2.59E-02	2.68E-02	3.31E-09	4.18E-10
1,2,3,4,7,8,9-HpCDF	1	2.09E-03	2.70E-03	2.79E-03	3.45E-10	4.35E-11
Other HpCDF	1	6.62E-03	8.54E-03	8.85E-03	1.09E-09	1.38E-10
OCDF	1	8.17E-03	1.05E-02	1.09E-02	1.35E-09	1.70E-10
TOTAL PCDF		2.28E-01	2.94E-01	3.05E-01	3.77E-08	4.75E-09
TOTAL PCDD/PCDF		3.98E-01	5.14E-01	5.32E-01	6.57E-08	8.28E-09

* In accordance with EPA Method 23, Section 9.9, results below the minimum detection limit were treated as zero when averaging or totaling the results. 68oF and 29.92 inches Hg

Unit 2 FF Outlet
Concentration and Emission Rate Summary
Run Number: 2-O-M23-2

Congener	UNITY	Concentration			Emission Rate	
		ng/DSCM	ng@12%	ng@7%	lb/hr	grams/sec
2,3,7,8-TCDD	1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Other TCDD	1	9.40E-03	1.31E-02	1.35E-02	1.61E-09	2.03E-10
1,2,3,7,8-PeCDD	1	1.19E-03	1.66E-03	1.71E-03	2.04E-10	2.57E-11
Other PeCDD	1	1.88E-02	2.62E-02	2.69E-02	3.21E-09	4.05E-10
1,2,3,4,7,8-HxCDD	1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,2,3,6,7,8-HxCDD	1	1.69E-03	2.36E-03	2.43E-03	2.90E-10	3.65E-11
1,2,3,7,8,9-HxCDD	1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Other HxCDD	1	2.60E-02	3.62E-02	3.72E-02	4.44E-09	5.60E-10
1,2,3,4,6,7,8-HpCDD	1	1.72E-02	2.40E-02	2.47E-02	2.95E-09	3.71E-10
Other HpCDD	1	1.56E-02	2.18E-02	2.24E-02	2.68E-09	3.37E-10
OCDD	1	2.63E-02	3.67E-02	3.77E-02	4.50E-09	5.68E-10
TOTAL PCDD		1.16E-01	1.62E-01	1.67E-01	1.99E-08	2.51E-09
2,3,7,8-TCDF	1	2.18E-03	3.04E-03	3.12E-03	3.73E-10	4.70E-11
Other TCDF	1	4.77E-02	6.65E-02	6.83E-02	8.16E-09	1.03E-09
1,2,3,7,8-PeCDF	1	3.62E-03	5.05E-03	5.18E-03	6.19E-10	7.80E-11
2,3,4,7,8-PeCDF	1	3.31E-03	4.63E-03	4.75E-03	5.67E-10	7.15E-11
Other PeCDF	1	3.14E-02	4.38E-02	4.50E-02	5.38E-09	6.77E-10
1,2,3,4,7,8-HxCDF	1	3.73E-03	5.20E-03	5.34E-03	6.37E-10	8.03E-11
1,2,3,6,7,8-HxCDF	1	3.89E-03	5.43E-03	5.57E-03	6.66E-10	8.39E-11
2,3,4,6,7,8-HxCDF	1	3.75E-03	5.24E-03	5.38E-03	6.42E-10	8.09E-11
1,2,3,7,8,9-HxCDF	1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Other HxCDF	1	1.45E-02	2.03E-02	2.08E-02	2.49E-09	3.14E-10
1,2,3,4,6,7,8-HpCDF	1	9.48E-03	1.32E-02	1.36E-02	1.62E-09	2.04E-10
1,2,3,4,7,8,9-HpCDF	1	1.78E-03	2.48E-03	2.55E-03	3.04E-10	3.83E-11
Other HpCDF	1	4.66E-03	6.50E-03	6.68E-03	7.97E-10	1.00E-10
OCDF	1	4.82E-03	6.73E-03	6.91E-03	8.25E-10	1.04E-10
TOTAL PCDF		1.35E-01	1.88E-01	1.93E-01	2.31E-08	2.91E-09
TOTAL PCDD/PCDF		2.51E-01	3.50E-01	3.60E-01	4.30E-08	5.41E-09

* In accordance with EPA Method 23, Section 9.9, results below the minimum detection limit were treated as zero when averaging or totaling the results. 68oF and 29.92 inches Hg

Unit 2 FF Outlet
Concentration and Emission Rate Summary
Run Number: 2-O-M23-3

Congener	UNITY	Concentration			Emission Rate	
		ng/DSCM	ng@12%	ng@7%	lb/hr	grams/sec
2,3,7,8-TCDD	1	9.33E-04	1.33E-03	1.35E-03	1.69E-10	2.13E-11
Other TCDD	1	4.22E-02	6.03E-02	6.11E-02	7.64E-09	9.62E-10
1,2,3,7,8-PeCDD	1	3.01E-03	4.30E-03	4.36E-03	5.46E-10	6.87E-11
Other PeCDD	1	6.50E-02	9.29E-02	9.42E-02	1.18E-08	1.48E-09
1,2,3,4,7,8-HxCDD	1	3.32E-03	4.75E-03	4.81E-03	6.02E-10	7.59E-11
1,2,3,6,7,8-HxCDD	1	1.04E-02	1.49E-02	1.51E-02	1.89E-09	2.38E-10
1,2,3,7,8,9-HxCDD	1	6.23E-03	8.91E-03	9.03E-03	1.13E-09	1.42E-10
Other HxCDD	1	1.24E-01	1.77E-01	1.80E-01	2.25E-08	2.83E-09
1,2,3,4,6,7,8-HpCDD	1	6.08E-02	8.68E-02	8.80E-02	1.10E-08	1.39E-09
Other HpCDD	1	6.31E-02	9.02E-02	9.14E-02	1.14E-08	1.44E-09
OCDD	1	9.43E-02	1.35E-01	1.37E-01	1.71E-08	2.15E-09
TOTAL PCDD		4.74E-01	6.76E-01	6.86E-01	8.57E-08	1.08E-08
2,3,7,8-TCDF	1	5.71E-03	8.16E-03	8.27E-03	1.03E-09	1.30E-10
Other TCDF	1	1.68E-01	2.40E-01	2.43E-01	3.04E-08	3.83E-09
1,2,3,7,8-PeCDF	1	9.56E-03	1.37E-02	1.38E-02	1.73E-09	2.18E-10
2,3,4,7,8-PeCDF	1	1.07E-02	1.53E-02	1.55E-02	1.94E-09	2.44E-10
Other PeCDF	1	9.95E-02	1.42E-01	1.44E-01	1.80E-08	2.27E-09
1,2,3,4,7,8-HxCDF	1	8.47E-03	1.21E-02	1.23E-02	1.53E-09	1.93E-10
1,2,3,6,7,8-HxCDF	1	1.19E-02	1.70E-02	1.73E-02	2.16E-09	2.72E-10
2,3,4,6,7,8-HxCDF	1	1.06E-02	1.52E-02	1.54E-02	1.92E-09	2.42E-10
1,2,3,7,8,9-HxCDF	1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Other HxCDF	1	4.35E-02	6.22E-02	6.30E-02	7.88E-09	9.93E-10
1,2,3,4,6,7,8-HpCDF	1	2.30E-02	3.28E-02	3.32E-02	4.16E-09	5.24E-10
1,2,3,4,7,8,9-HpCDF	1	2.03E-03	2.90E-03	2.94E-03	3.68E-10	4.63E-11
Other HpCDF	1	6.96E-03	9.94E-03	1.01E-02	1.26E-09	1.59E-10
OCDF	1	7.20E-03	1.03E-02	1.04E-02	1.30E-09	1.64E-10
TOTAL PCDF		4.07E-01	5.81E-01	5.89E-01	7.37E-08	9.28E-09
TOTAL PCDD/PCDF		8.81E-01	1.26E+00	1.27E+00	1.59E-07	2.01E-08

* In accordance with EPA Method 23, Section 9.9, results below the minimum detection limit were treated as zero when averaging or totaling the results. 68oF and 29.92 inches Hg

Unit 2 FF Outlet
Average Concentration and Emission Rate Summary

Congener	UNITY	Concentration			Emission Rate	
		ng/DSCM	ng@12%	ng@7%	lb/hr	grams/sec
2,3,7,8-TCDD	1	3.11E-04	4.44E-04	4.50E-04	5.63E-11	7.09E-12
Other TCDD	1	2.08E-02	2.92E-02	2.97E-02	3.68E-09	4.64E-10
1,2,3,7,8-PeCDD	1	1.93E-03	2.67E-03	2.73E-03	3.37E-10	4.24E-11
Other PeCDD	1	3.38E-02	4.73E-02	4.82E-02	5.97E-09	7.52E-10
1,2,3,4,7,8-HxCDD	1	1.71E-03	2.36E-03	2.41E-03	3.00E-10	3.78E-11
1,2,3,6,7,8-HxCDD	1	5.26E-03	7.33E-03	7.47E-03	9.27E-10	1.17E-10
1,2,3,7,8,9-HxCDD	1	3.15E-03	4.35E-03	4.44E-03	5.53E-10	6.97E-11
Other HxCDD	1	6.27E-02	8.75E-02	8.92E-02	1.11E-08	1.39E-09
1,2,3,4,6,7,8-HpCDD	1	3.36E-02	4.68E-02	4.77E-02	5.91E-09	7.44E-10
Other HpCDD	1	3.46E-02	4.81E-02	4.91E-02	6.09E-09	7.67E-10
OCDD	1	5.53E-02	7.66E-02	7.82E-02	9.68E-09	1.22E-09
TOTAL PCDD		2.53E-01	3.53E-01	3.60E-01	4.46E-08	5.61E-09
2,3,7,8-TCDF	1	3.97E-03	5.46E-03	5.59E-03	6.90E-10	8.70E-11
Other TCDF	1	9.46E-02	1.32E-01	1.34E-01	1.66E-08	2.09E-09
1,2,3,7,8-PeCDF	1	6.00E-03	8.31E-03	8.49E-03	1.05E-09	1.32E-10
2,3,4,7,8-PeCDF	1	7.01E-03	9.65E-03	9.87E-03	1.22E-09	1.54E-10
Other PeCDF	1	6.28E-02	8.68E-02	8.87E-02	1.10E-08	1.38E-09
1,2,3,4,7,8-HxCDF	1	6.31E-03	8.66E-03	8.87E-03	1.09E-09	1.38E-10
1,2,3,6,7,8-HxCDF	1	7.89E-03	1.09E-02	1.11E-02	1.37E-09	1.73E-10
2,3,4,6,7,8-HxCDF	1	6.83E-03	9.44E-03	9.65E-03	1.19E-09	1.50E-10
1,2,3,7,8,9-HxCDF	1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Other HxCDF	1	2.89E-02	3.98E-02	4.07E-02	5.03E-09	6.34E-10
1,2,3,4,6,7,8-HpCDF	1	1.75E-02	2.40E-02	2.46E-02	3.03E-09	3.82E-10
1,2,3,4,7,8,9-HpCDF	1	1.97E-03	2.69E-03	2.76E-03	3.39E-10	4.27E-11
Other HpCDF	1	6.08E-03	8.33E-03	8.53E-03	1.05E-09	1.32E-10
OCDF	1	6.73E-03	9.18E-03	9.41E-03	1.16E-09	1.46E-10
TOTAL PCDF		2.57E-01	3.55E-01	3.62E-01	4.48E-08	5.65E-09
TOTAL PCDD/PCDF		5.10E-01	7.07E-01	7.22E-01	8.94E-08	1.13E-08

* In accordance with EPA Method 23, Section 9.9, results below the minimum detection limit were treated as zero when averaging or totaling the results. 68oF and 29.92 inches Hg

Unit 2 FF Outlet
Concentration and Emission Rate Summary
Run Number: 2-O-M23-1

Congener	NY TEF	Concentration			Emission Rate	
		ng/DSCM	ng@12%	ng@7%	lb/hr	grams/sec
2,3,7,8-TCDD	1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Other TCDD	0.01	1.10E-04	1.41E-04	1.46E-04	1.81E-11	2.28E-12
1,2,3,7,8-PeCDD	1	1.58E-03	2.03E-03	2.11E-03	2.60E-10	3.28E-11
Other PeCDD	0.01	1.76E-04	2.27E-04	2.35E-04	2.91E-11	3.66E-12
1,2,3,4,7,8-HxCDD	0.03	5.43E-05	7.01E-05	7.26E-05	8.96E-12	1.13E-12
1,2,3,6,7,8-HxCDD	0.03	1.09E-04	1.41E-04	1.46E-04	1.80E-11	2.27E-12
1,2,3,7,8,9-HxCDD	0.03	9.64E-05	1.24E-04	1.29E-04	1.59E-11	2.00E-12
Other HxCDD	0.0003	1.14E-05	1.47E-05	1.52E-05	1.88E-12	2.37E-13
1,2,3,4,6,7,8-HpCDD	0.001	2.28E-05	2.95E-05	3.05E-05	3.77E-12	4.75E-13
Other HpCDD	0.00001	2.51E-07	3.24E-07	3.36E-07	4.15E-14	5.23E-15
OCDD	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TOTAL PCDD		2.16E-03	2.78E-03	2.88E-03	3.56E-10	4.48E-11
2,3,7,8-TCDF	0.33	1.32E-03	1.71E-03	1.77E-03	2.19E-10	2.76E-11
Other TCDF	0.003	2.05E-04	2.65E-04	2.75E-04	3.39E-11	4.27E-12
1,2,3,7,8-PeCDF	0.33	1.59E-03	2.06E-03	2.13E-03	2.63E-10	3.32E-11
2,3,4,7,8-PeCDF	0.33	2.31E-03	2.98E-03	3.09E-03	3.82E-10	4.81E-11
Other PeCDF	0.003	1.73E-04	2.23E-04	2.31E-04	2.85E-11	3.59E-12
1,2,3,4,7,8-HxCDF	0.01	6.74E-05	8.69E-05	9.00E-05	1.11E-11	1.40E-12
1,2,3,6,7,8-HxCDF	0.01	7.86E-05	1.01E-04	1.05E-04	1.30E-11	1.63E-12
2,3,4,6,7,8-HxCDF	0.01	6.12E-05	7.90E-05	8.19E-05	1.01E-11	1.27E-12
1,2,3,7,8,9-HxCDF	0.01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Other HxCDF	0.0001	2.86E-06	3.69E-06	3.82E-06	4.72E-13	5.95E-14
1,2,3,4,6,7,8-HpCDF	0.001	2.01E-05	2.59E-05	2.68E-05	3.31E-12	4.18E-13
1,2,3,4,7,8,9-HpCDF	0.001	2.09E-06	2.70E-06	2.79E-06	3.45E-13	4.35E-14
Other HpCDF	0.00001	6.62E-08	8.54E-08	8.85E-08	1.09E-14	1.38E-15
OCDF	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TOTAL PCDF		5.84E-03	7.54E-03	7.81E-03	9.64E-10	1.22E-10
TOTAL PCDD/PCDF		8.00E-03	1.03E-02	1.07E-02	1.32E-09	1.66E-10

* In accordance with EPA Method 23, Section 9.9, results below the minimum detection limit were treated as zero when averaging or totaling the results. 68oF and 29.92 inches Hg

Unit 2 FF Outlet
Concentration and Emission Rate Summary
Run Number: 2-O-M23-2

Congener	NY TEF	Concentration			Emission Rate	
		ng/DSCM	ng@12%	ng@7%	lb/hr	grams/sec
2,3,7,8-TCDD	1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Other TCDD	0.01	9.40E-05	1.31E-04	1.35E-04	1.61E-11	2.03E-12
1,2,3,7,8-PeCDD	1	1.19E-03	1.66E-03	1.71E-03	2.04E-10	2.57E-11
Other PeCDD	0.01	1.88E-04	2.62E-04	2.69E-04	3.21E-11	4.05E-12
1,2,3,4,7,8-HxCDD	0.03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,2,3,6,7,8-HxCDD	0.03	5.08E-05	7.09E-05	7.28E-05	8.69E-12	1.09E-12
1,2,3,7,8,9-HxCDD	0.03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Other HxCDD	0.0003	7.79E-06	1.09E-05	1.12E-05	1.33E-12	1.68E-13
1,2,3,4,6,7,8-HpCDD	0.001	1.72E-05	2.40E-05	2.47E-05	2.95E-12	3.71E-13
Other HpCDD	0.00001	1.56E-07	2.18E-07	2.24E-07	2.68E-14	3.37E-15
OCDD	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TOTAL PCDD		1.55E-03	2.16E-03	2.22E-03	2.65E-10	3.34E-11
2,3,7,8-TCDF	0.33	7.20E-04	1.00E-03	1.03E-03	1.23E-10	1.55E-11
Other TCDF	0.003	1.43E-04	2.00E-04	2.05E-04	2.45E-11	3.08E-12
1,2,3,7,8-PeCDF	0.33	1.19E-03	1.67E-03	1.71E-03	2.04E-10	2.57E-11
2,3,4,7,8-PeCDF	0.33	1.09E-03	1.53E-03	1.57E-03	1.87E-10	2.36E-11
Other PeCDF	0.003	9.43E-05	1.32E-04	1.35E-04	1.61E-11	2.03E-12
1,2,3,4,7,8-HxCDF	0.01	3.73E-05	5.20E-05	5.34E-05	6.37E-12	8.03E-13
1,2,3,6,7,8-HxCDF	0.01	3.89E-05	5.43E-05	5.57E-05	6.66E-12	8.39E-13
2,3,4,6,7,8-HxCDF	0.01	3.75E-05	5.24E-05	5.38E-05	6.42E-12	8.09E-13
1,2,3,7,8,9-HxCDF	0.01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Other HxCDF	0.0001	1.45E-06	2.03E-06	2.08E-06	2.49E-13	3.14E-14
1,2,3,4,6,7,8-HpCDF	0.001	9.48E-06	1.32E-05	1.36E-05	1.62E-12	2.04E-13
1,2,3,4,7,8,9-HpCDF	0.001	1.78E-06	2.48E-06	2.55E-06	3.04E-13	3.83E-14
Other HpCDF	0.00001	4.66E-08	6.50E-08	6.68E-08	7.97E-15	1.00E-15
OCDF	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TOTAL PCDF		3.37E-03	4.70E-03	4.83E-03	5.77E-10	7.27E-11
TOTAL PCDD/PCDF		4.92E-03	6.87E-03	7.05E-03	8.42E-10	1.06E-10

* In accordance with EPA Method 23, Section 9.9, results below the minimum detection limit were treated as zero when averaging or totaling the results. 68oF and 29.92 inches Hg

Unit 2 FF Outlet
Concentration and Emission Rate Summary
Run Number: 2-O-M23-3

Congener	NY TEF	Concentration			Emission Rate	
		ng/DSCM	ng@12%	ng@7%	lb/hr	grams/sec
2,3,7,8-TCDD	1	9.33E-04	1.33E-03	1.35E-03	1.69E-10	2.13E-11
Other TCDD	0.01	4.22E-04	6.03E-04	6.11E-04	7.64E-11	9.62E-12
1,2,3,7,8-PeCDD	1	3.01E-03	4.30E-03	4.36E-03	5.46E-10	6.87E-11
Other PeCDD	0.01	6.50E-04	9.29E-04	9.42E-04	1.18E-10	1.48E-11
1,2,3,4,7,8-HxCDD	0.03	9.97E-05	1.42E-04	1.44E-04	1.81E-11	2.28E-12
1,2,3,6,7,8-HxCDD	0.03	3.13E-04	4.48E-04	4.54E-04	5.67E-11	7.15E-12
1,2,3,7,8,9-HxCDD	0.03	1.87E-04	2.67E-04	2.71E-04	3.39E-11	4.27E-12
Other HxCDD	0.0003	3.72E-05	5.32E-05	5.39E-05	6.74E-12	8.50E-13
1,2,3,4,6,7,8-HpCDD	0.001	6.08E-05	8.68E-05	8.80E-05	1.10E-11	1.39E-12
Other HpCDD	0.00001	6.31E-07	9.02E-07	9.14E-07	1.14E-13	1.44E-14
OCDD	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TOTAL PCDD		5.72E-03	8.17E-03	8.28E-03	1.04E-09	1.30E-10
2,3,7,8-TCDF	0.33	1.89E-03	2.69E-03	2.73E-03	3.41E-10	4.30E-11
Other TCDF	0.003	5.03E-04	7.19E-04	7.29E-04	9.12E-11	1.15E-11
1,2,3,7,8-PeCDF	0.33	3.15E-03	4.51E-03	4.57E-03	5.71E-10	7.20E-11
2,3,4,7,8-PeCDF	0.33	3.53E-03	5.05E-03	5.11E-03	6.39E-10	8.06E-11
Other PeCDF	0.003	2.98E-04	4.26E-04	4.32E-04	5.40E-11	6.81E-12
1,2,3,4,7,8-HxCDF	0.01	8.47E-05	1.21E-04	1.23E-04	1.53E-11	1.93E-12
1,2,3,6,7,8-HxCDF	0.01	1.19E-04	1.70E-04	1.73E-04	2.16E-11	2.72E-12
2,3,4,6,7,8-HxCDF	0.01	1.06E-04	1.52E-04	1.54E-04	1.92E-11	2.42E-12
1,2,3,7,8,9-HxCDF	0.01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Other HxCDF	0.0001	4.35E-06	6.22E-06	6.30E-06	7.88E-13	9.93E-14
1,2,3,4,6,7,8-HpCDF	0.001	2.30E-05	3.28E-05	3.32E-05	4.16E-12	5.24E-13
1,2,3,4,7,8,9-HpCDF	0.001	2.03E-06	2.90E-06	2.94E-06	3.68E-13	4.63E-14
Other HpCDF	0.00001	6.96E-08	9.94E-08	1.01E-07	1.26E-14	1.59E-15
OCDF	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TOTAL PCDF		9.71E-03	1.39E-02	1.41E-02	1.76E-09	2.22E-10
TOTAL PCDD/PCDF		1.54E-02	2.20E-02	2.23E-02	2.79E-09	3.52E-10

* In accordance with EPA Method 23, Section 9.9, results below the minimum detection limit were treated as zero when averaging or totaling the results. 68oF and 29.92 inches Hg

Unit 2 FF Outlet
Average Concentration and Emission Rate Summary

Congener	NY TEF	Concentration			Emission Rate	
		ng/DSCM	ng@12%	ng@7%	lb/hr	grams/sec
2,3,7,8-TCDD	1	3.11E-04	4.44E-04	4.50E-04	5.63E-11	7.09E-12
Other TCDD	0.01	2.08E-04	2.92E-04	2.97E-04	3.68E-11	4.64E-12
1,2,3,7,8-PeCDD	1	1.93E-03	2.67E-03	2.73E-03	3.37E-10	4.24E-11
Other PeCDD	0.01	3.38E-04	4.73E-04	4.82E-04	5.97E-11	7.52E-12
1,2,3,4,7,8-HxCDD	0.03	5.14E-05	7.09E-05	7.23E-05	9.01E-12	1.14E-12
1,2,3,6,7,8-HxCDD	0.03	1.58E-04	2.20E-04	2.24E-04	2.78E-11	3.50E-12
1,2,3,7,8,9-HxCDD	0.03	9.45E-05	1.31E-04	1.33E-04	1.66E-11	2.09E-12
Other HxCDD	0.0003	1.88E-05	2.63E-05	2.68E-05	3.32E-12	4.18E-13
1,2,3,4,6,7,8-HpCDD	0.001	3.36E-05	4.68E-05	4.77E-05	5.91E-12	7.44E-13
Other HpCDD	0.00001	3.46E-07	4.81E-07	4.91E-07	6.09E-14	7.67E-15
OCDD	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TOTAL PCDD		3.14E-03	4.37E-03	4.46E-03	5.52E-10	6.96E-11
2,3,7,8-TCDF	0.33	1.31E-03	1.80E-03	1.84E-03	2.28E-10	2.87E-11
Other TCDF	0.003	2.84E-04	3.95E-04	4.03E-04	4.98E-11	6.28E-12
1,2,3,7,8-PeCDF	0.33	1.98E-03	2.74E-03	2.80E-03	3.46E-10	4.36E-11
2,3,4,7,8-PeCDF	0.33	2.31E-03	3.19E-03	3.26E-03	4.03E-10	5.08E-11
Other PeCDF	0.003	1.88E-04	2.60E-04	2.66E-04	3.29E-11	4.14E-12
1,2,3,4,7,8-HxCDF	0.01	6.31E-05	8.66E-05	8.87E-05	1.09E-11	1.38E-12
1,2,3,6,7,8-HxCDF	0.01	7.89E-05	1.09E-04	1.11E-04	1.37E-11	1.73E-12
2,3,4,6,7,8-HxCDF	0.01	6.83E-05	9.44E-05	9.65E-05	1.19E-11	1.50E-12
1,2,3,7,8,9-HxCDF	0.01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Other HxCDF	0.0001	2.89E-06	3.98E-06	4.07E-06	5.03E-13	6.34E-14
1,2,3,4,6,7,8-HpCDF	0.001	1.75E-05	2.40E-05	2.46E-05	3.03E-12	3.82E-13
1,2,3,4,7,8,9-HpCDF	0.001	1.97E-06	2.69E-06	2.76E-06	3.39E-13	4.27E-14
Other HpCDF	0.00001	6.08E-08	8.33E-08	8.53E-08	1.05E-14	1.32E-15
OCDF	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TOTAL PCDF		6.31E-03	8.71E-03	8.90E-03	1.10E-09	1.39E-10
TOTAL PCDD/PCDF		9.45E-03	1.31E-02	1.34E-02	1.65E-09	2.08E-10

* In accordance with EPA Method 23, Section 9.9, results below the minimum detection limit were treated as zero when averaging or totaling the results. 68oF and 29.92 inches Hg

Unit 2 FF Outlet
Concentration and Emission Rate Summary
Run Number: 2-O-M23-1

Congener	1989 ITEF	Concentration			Emission Rate	
		ng/DSCM	ng@12%	ng@7%	lb/hr	grams/sec
2,3,7,8-TCDD	1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Other TCDD	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,2,3,7,8-PeCDD	0.5	7.88E-04	1.02E-03	1.05E-03	1.30E-10	1.64E-11
Other PeCDD	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,2,3,4,7,8-HxCDD	0.1	1.81E-04	2.34E-04	2.42E-04	2.99E-11	3.76E-12
1,2,3,6,7,8-HxCDD	0.1	3.64E-04	4.70E-04	4.87E-04	6.01E-11	7.57E-12
1,2,3,7,8,9-HxCDD	0.1	3.21E-04	4.14E-04	4.29E-04	5.30E-11	6.68E-12
Other HxCDD	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,2,3,4,6,7,8-HpCDD	0.01	2.28E-04	2.95E-04	3.05E-04	3.77E-11	4.75E-12
Other HpCDD	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
OCDD	0.001	4.53E-05	5.84E-05	6.05E-05	7.47E-12	9.41E-13
TOTAL PCDD		1.93E-03	2.49E-03	2.58E-03	3.18E-10	4.01E-11
2,3,7,8-TCDF	0.1	4.02E-04	5.18E-04	5.37E-04	6.63E-11	8.35E-12
Other TCDF	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,2,3,7,8-PeCDF	0.05	2.42E-04	3.12E-04	3.23E-04	3.99E-11	5.02E-12
2,3,4,7,8-PeCDF	0.5	3.50E-03	4.52E-03	4.68E-03	5.79E-10	7.29E-11
Other PeCDF	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,2,3,4,7,8-HxCDF	0.1	6.74E-04	8.69E-04	9.00E-04	1.11E-10	1.40E-11
1,2,3,6,7,8-HxCDF	0.1	7.86E-04	1.01E-03	1.05E-03	1.30E-10	1.63E-11
2,3,4,6,7,8-HxCDF	0.1	6.12E-04	7.90E-04	8.19E-04	1.01E-10	1.27E-11
1,2,3,7,8,9-HxCDF	0.1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Other HxCDF	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,2,3,4,6,7,8-HpCDF	0.01	2.01E-04	2.59E-04	2.68E-04	3.31E-11	4.18E-12
1,2,3,4,7,8,9-HpCDF	0.01	2.09E-05	2.70E-05	2.79E-05	3.45E-12	4.35E-13
Other HpCDF	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
OCDF	0.001	8.17E-06	1.05E-05	1.09E-05	1.35E-12	1.70E-13
TOTAL PCDF		6.45E-03	8.32E-03	8.62E-03	1.06E-09	1.34E-10
TOTAL PCDD/PCDF		8.38E-03	1.08E-02	1.12E-02	1.38E-09	1.74E-10

* In accordance with EPA Method 23, Section 9.9, results below the minimum detection limit were treated as zero when averaging or totaling the results. 68oF and 29.92 inches Hg

Unit 2 FF Outlet
Concentration and Emission Rate Summary
Run Number: 2-O-M23-2

Congener	1989 ITEF	Concentration			Emission Rate	
		ng/DSCM	ng@12%	ng@7%	lb/hr	grams/sec
2,3,7,8-TCDD	1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Other TCDD	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,2,3,7,8-PeCDD	0.5	5.96E-04	8.31E-04	8.54E-04	1.02E-10	1.28E-11
Other PeCDD	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,2,3,4,7,8-HxCDD	0.1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,2,3,6,7,8-HxCDD	0.1	1.69E-04	2.36E-04	2.43E-04	2.90E-11	3.65E-12
1,2,3,7,8,9-HxCDD	0.1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Other HxCDD	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,2,3,4,6,7,8-HpCDD	0.01	1.72E-04	2.40E-04	2.47E-04	2.95E-11	3.71E-12
Other HpCDD	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
OCDD	0.001	2.63E-05	3.67E-05	3.77E-05	4.50E-12	5.68E-13
TOTAL PCDD		9.64E-04	1.34E-03	1.38E-03	1.65E-10	2.08E-11
2,3,7,8-TCDF	0.1	2.18E-04	3.04E-04	3.12E-04	3.73E-11	4.70E-12
Other TCDF	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,2,3,7,8-PeCDF	0.05	1.81E-04	2.52E-04	2.59E-04	3.09E-11	3.90E-12
2,3,4,7,8-PeCDF	0.5	1.66E-03	2.31E-03	2.38E-03	2.84E-10	3.57E-11
Other PeCDF	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,2,3,4,7,8-HxCDF	0.1	3.73E-04	5.20E-04	5.34E-04	6.37E-11	8.03E-12
1,2,3,6,7,8-HxCDF	0.1	3.89E-04	5.43E-04	5.57E-04	6.66E-11	8.39E-12
2,3,4,6,7,8-HxCDF	0.1	3.75E-04	5.24E-04	5.38E-04	6.42E-11	8.09E-12
1,2,3,7,8,9-HxCDF	0.1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Other HxCDF	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,2,3,4,6,7,8-HpCDF	0.01	9.48E-05	1.32E-04	1.36E-04	1.62E-11	2.04E-12
1,2,3,4,7,8,9-HpCDF	0.01	1.78E-05	2.48E-05	2.55E-05	3.04E-12	3.83E-13
Other HpCDF	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
OCDF	0.001	4.82E-06	6.73E-06	6.91E-06	8.25E-13	1.04E-13
TOTAL PCDF		3.31E-03	4.62E-03	4.74E-03	5.66E-10	7.14E-11
TOTAL PCDD/PCDF		4.27E-03	5.96E-03	6.13E-03	7.31E-10	9.21E-11

* In accordance with EPA Method 23, Section 9.9, results below the minimum detection limit were treated as zero when averaging or totaling the results. 68oF and 29.92 inches Hg

Unit 2 FF Outlet
Concentration and Emission Rate Summary
Run Number: 2-O-M23-3

Congener	1989 ITEF	Concentration			Emission Rate	
		ng/DSCM	ng@12%	ng@7%	lb/hr	grams/sec
2,3,7,8-TCDD	1	9.33E-04	1.33E-03	1.35E-03	1.69E-10	2.13E-11
Other TCDD	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,2,3,7,8-PeCDD	0.5	1.51E-03	2.15E-03	2.18E-03	2.73E-10	3.44E-11
Other PeCDD	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,2,3,4,7,8-HxCDD	0.1	3.32E-04	4.75E-04	4.81E-04	6.02E-11	7.59E-12
1,2,3,6,7,8-HxCDD	0.1	1.04E-03	1.49E-03	1.51E-03	1.89E-10	2.38E-11
1,2,3,7,8,9-HxCDD	0.1	6.23E-04	8.91E-04	9.03E-04	1.13E-10	1.42E-11
Other HxCDD	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,2,3,4,6,7,8-HpCDD	0.01	6.08E-04	8.68E-04	8.80E-04	1.10E-10	1.39E-11
Other HpCDD	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
OCDD	0.001	9.43E-05	1.35E-04	1.37E-04	1.71E-11	2.15E-12
TOTAL PCDD		5.14E-03	7.34E-03	7.44E-03	9.31E-10	1.17E-10
2,3,7,8-TCDF	0.1	5.71E-04	8.16E-04	8.27E-04	1.03E-10	1.30E-11
Other TCDF	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,2,3,7,8-PeCDF	0.05	4.78E-04	6.83E-04	6.92E-04	8.65E-11	1.09E-11
2,3,4,7,8-PeCDF	0.5	5.35E-03	7.64E-03	7.75E-03	9.69E-10	1.22E-10
Other PeCDF	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,2,3,4,7,8-HxCDF	0.1	8.47E-04	1.21E-03	1.23E-03	1.53E-10	1.93E-11
1,2,3,6,7,8-HxCDF	0.1	1.19E-03	1.70E-03	1.73E-03	2.16E-10	2.72E-11
2,3,4,6,7,8-HxCDF	0.1	1.06E-03	1.52E-03	1.54E-03	1.92E-10	2.42E-11
1,2,3,7,8,9-HxCDF	0.1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Other HxCDF	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,2,3,4,6,7,8-HpCDF	0.01	2.30E-04	3.28E-04	3.32E-04	4.16E-11	5.24E-12
1,2,3,4,7,8,9-HpCDF	0.01	2.03E-05	2.90E-05	2.94E-05	3.68E-12	4.63E-13
Other HpCDF	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
OCDF	0.001	7.20E-06	1.03E-05	1.04E-05	1.30E-12	1.64E-13
TOTAL PCDF		9.76E-03	1.39E-02	1.41E-02	1.77E-09	2.23E-10
TOTAL PCDD/PCDF		1.49E-02	2.13E-02	2.16E-02	2.70E-09	3.40E-10

* In accordance with EPA Method 23, Section 9.9, results below the minimum detection limit were treated as zero when averaging or totaling the results. 68oF and 29.92 inches Hg

Unit 2 FF Outlet
Average Concentration and Emission Rate Summary

Congener	1989 ITEF	Concentration			Emission Rate	
		ng/DSCM	ng@12%	ng@7%	lb/hr	grams/sec
2,3,7,8-TCDD	1	3.11E-04	4.44E-04	4.50E-04	5.63E-11	7.09E-12
Other TCDD	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,2,3,7,8-PeCDD	0.5	9.63E-04	1.33E-03	1.36E-03	1.68E-10	2.12E-11
Other PeCDD	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,2,3,4,7,8-HxCDD	0.1	1.71E-04	2.36E-04	2.41E-04	3.00E-11	3.78E-12
1,2,3,6,7,8-HxCDD	0.1	5.26E-04	7.33E-04	7.47E-04	9.27E-11	1.17E-11
1,2,3,7,8,9-HxCDD	0.1	3.15E-04	4.35E-04	4.44E-04	5.53E-11	6.97E-12
Other HxCDD	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,2,3,4,6,7,8-HpCDD	0.01	3.36E-04	4.68E-04	4.77E-04	5.91E-11	7.44E-12
Other HpCDD	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
OCDD	0.001	5.53E-05	7.66E-05	7.82E-05	9.68E-12	1.22E-12
TOTAL PCDD		2.68E-03	3.73E-03	3.80E-03	4.71E-10	5.94E-11
2,3,7,8-TCDF	0.1	3.97E-04	5.46E-04	5.59E-04	6.90E-11	8.70E-12
Other TCDF	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,2,3,7,8-PeCDF	0.05	3.00E-04	4.16E-04	4.25E-04	5.25E-11	6.61E-12
2,3,4,7,8-PeCDF	0.5	3.50E-03	4.83E-03	4.94E-03	6.10E-10	7.69E-11
Other PeCDF	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,2,3,4,7,8-HxCDF	0.1	6.31E-04	8.66E-04	8.87E-04	1.09E-10	1.38E-11
1,2,3,6,7,8-HxCDF	0.1	7.89E-04	1.09E-03	1.11E-03	1.37E-10	1.73E-11
2,3,4,6,7,8-HxCDF	0.1	6.83E-04	9.44E-04	9.65E-04	1.19E-10	1.50E-11
1,2,3,7,8,9-HxCDF	0.1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Other HxCDF	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,2,3,4,6,7,8-HpCDF	0.01	1.75E-04	2.40E-04	2.46E-04	3.03E-11	3.82E-12
1,2,3,4,7,8,9-HpCDF	0.01	1.97E-05	2.69E-05	2.76E-05	3.39E-12	4.27E-13
Other HpCDF	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
OCDF	0.001	6.73E-06	9.18E-06	9.41E-06	1.16E-12	1.46E-13
TOTAL PCDF		6.51E-03	8.96E-03	9.16E-03	1.13E-09	1.43E-10
TOTAL PCDD/PCDF		9.18E-03	1.27E-02	1.30E-02	1.60E-09	2.02E-10

* In accordance with EPA Method 23, Section 9.9, results below the minimum detection limit were treated as zero when averaging or totaling the results. 68oF and 29.92 inches Hg

ISOKINETIC SAMPLING TRAIN RESULTS - METHOD

23

Client Name	Covanta Energy Group, Inc.	Operator	CAN
Plant Name	Huntington Resource Recovery Facility	Project #	10843
Sampling Location	Unit 2 FF Outlet	Standard Temperature, °F	68

USE IN AVERAGE OF RUN SET? 1 or 0 =>	1	1	1	SET AVERAGE
Run Number		2-O-M23-1	2-O-M23-2	
Run Date		08/28/12	08/30/12	
Run Start Time	hh:mm	1333	756	
Run Stop Time	hh:mm	1814	1159	1610

Sampling Parameters

Meter Calibration Factor	Y	1.0176	1.0065	1.0176	
Y _{OA} Calculated by Test Run	Y _{OA}	0.9795	1.0013	1.0038	
Y _{OA} PASS/FAIL by Test Run	Check	PASS	PASS	PASS	PASS
Pitot Tube Coefficient	C _p	0.84	0.84	0.84	
Stack/Duct Static Pressure	in H ₂ O	-15.00	-15.00	-15.00	-15.00
Stack Cross-Sectional Area	ft ²	21.648	21.648	21.648	21.648
Barometric Pressure	in Hg	29.7	29.9	29.9	29.8
Actual Nozzle Diameter	in	0.197	0.218	0.218	
Carbon Dioxide Percentage	% CO ₂	9.3	8.6	8.4	8.8
Oxygen Percentage	% O ₂	10.5	11.2	11.3	11.0
Carbon Monoxide Percentage	% CO	0.0	0.0	0.0	0.0
Nitrogen Percentage	% N ₂	80.2	80.2	80.3	80.2
Total Water Volume Collected	mL	459.5	567.0	573.5	533.3
Sample Volume	ft ³	106.479	129.473	137.155	124.369
Average Meter Temperature	°F	88	75	83	82
Average Stack Temperature	°F	278	276	278	277
Average Delta H	in H ₂ O	0.56	1.01	0.99	0.85
Total Sampling Time	min	240	240	240	240

Air Flow Parameters

Volume of Water vapor @ STP	SCF	21.629	26.689	26.995	25.104
Volume Metered @ STP	DSCF	103.771	128.891	135.934	122.866
Absolute Stack/Duct Pressure	in Hg	28.6	28.8	28.8	28.7
Absolute Meter Pressure	in Hg	29.7	30.0	30.0	29.9
Calculated Stack Moisture	% H ₂ O	17.2	17.2	16.6	17.0
Saturated Stack Moisture	% H ₂ O	100.0	100.0	100.0	100.0
Reported Stack Moisture Content	% H ₂ O	17.2	17.2	16.6	17.0
Dry Mole Fraction	decimal	0.828	0.828	0.834	0.830
Avg Differential Press. (Delta P)	in H ₂ O	0.753	0.796	0.883	0.811
Dry Gas Molecular Weight	lb/lb-mole	29.91	29.82	29.80	29.84
Wet Stack Gas Molecular Weight	lb/lb-mole	27.85	27.80	27.84	27.83
Average Stack Gas Velocity	ft/sec	59.98	61.44	64.75	62.05
Percent of Isokinetic Rate	% ISO	100.4	98.3	97.9	98.9

Air Flow Rate Results

Actual Stack Flow/Minute	ACFM	77,907	79,799	84,098	80,601
Dry Standard Stack Flow/Minute	DSCFM	44,063	45,670	48,334	46,022

Concentration and Emission Rate Data Summary					
Acenaphthene	ng	4.9	3.9	5.8	4.9
Concentration, ug/Nm3	ug/Nm3	1.66E-03	1.08E-03	1.50E-03	1.41E-03
Concen., ug/Nm3 @ 12% CO2	ug@12%	2.15E-03	1.51E-03	2.14E-03	1.93E-03
Concen., ug/Nm3 @ 7% O2	ug@7%	2.22E-03	1.55E-03	2.17E-03	1.98E-03
Emission Rate, lb/hr	lb/hr	2.75E-07	1.85E-07	2.71E-07	2.43E-07
Emission Rate, grams/second	g/s	3.46E-08	2.33E-08	3.41E-08	3.07E-08
Acenaphthylene	ng	1.6	1.6	3.7	2.3
Concentration, ug/Nm3	ug/Nm3	5.27E-04	4.33E-04	9.51E-04	6.37E-04
Concen., ug/Nm3 @ 12% CO2	ug@12%	6.81E-04	6.04E-04	1.36E-03	8.81E-04
Concen., ug/Nm3 @ 7% O2	ug@7%	7.05E-04	6.20E-04	1.38E-03	9.01E-04
Emission Rate, lb/hr	lb/hr	8.71E-08	7.41E-08	1.72E-07	1.11E-07
Emission Rate, grams/second	g/s	1.10E-08	9.33E-09	2.17E-08	1.40E-08
Anthracene	ng	3.2	4.1	8.9	5.4
Concentration, ug/Nm3	ug/Nm3	1.08E-03	1.11E-03	2.32E-03	1.50E-03
Concen., ug/Nm3 @ 12% CO2	ug@12%	1.40E-03	1.55E-03	3.31E-03	2.09E-03
Concen., ug/Nm3 @ 7% O2	ug@7%	1.45E-03	1.59E-03	3.36E-03	2.13E-03
Emission Rate, lb/hr	lb/hr	1.79E-07	1.90E-07	4.20E-07	2.63E-07
Emission Rate, grams/second	g/s	2.25E-08	2.40E-08	5.29E-08	3.31E-08
Benzo[a]anthracene	ng	0.6	1.3	1.2	1.0
Concentration, ug/Nm3	ug/Nm3	2.11E-04	3.64E-04	3.12E-04	2.96E-04
Concen., ug/Nm3 @ 12% CO2	ug@12%	2.72E-04	5.08E-04	4.45E-04	4.08E-04
Concen., ug/Nm3 @ 7% O2	ug@7%	2.82E-04	5.22E-04	4.51E-04	4.18E-04
Emission Rate, lb/hr	lb/hr	3.48E-08	6.23E-08	5.64E-08	5.12E-08
Emission Rate, grams/second	g/s	4.38E-09	7.85E-09	7.11E-09	6.45E-09
Benzo[a]pyrene	ng	0.6	4.0	1.5	2.0
Concentration, ug/Nm3	ug/Nm3	1.96E-04	1.11E-03	3.92E-04	5.65E-04
Concen., ug/Nm3 @ 12% CO2	ug@12%	2.53E-04	1.54E-03	5.60E-04	7.86E-04
Concen., ug/Nm3 @ 7% O2	ug@7%	2.62E-04	1.59E-03	5.68E-04	8.05E-04
Emission Rate, lb/hr	lb/hr	3.24E-08	1.89E-07	7.10E-08	9.76E-08
Emission Rate, grams/second	g/s	4.08E-09	2.39E-08	8.95E-09	1.23E-08
Benzo[b]fluoranthene	ng	2.6	6.0	4.7	4.4
Concentration, ug/Nm3	ug/Nm3	8.78E-04	1.63E-03	1.23E-03	1.25E-03
Concen., ug/Nm3 @ 12% CO2	ug@12%	1.13E-03	2.27E-03	1.76E-03	1.72E-03
Concen., ug/Nm3 @ 7% O2	ug@7%	1.17E-03	2.34E-03	1.78E-03	1.76E-03
Emission Rate, lb/hr	lb/hr	1.45E-07	2.79E-07	2.23E-07	2.16E-07
Emission Rate, grams/second	g/s	1.83E-08	3.51E-08	2.81E-08	2.72E-08
Benzo[e]pyrene	ng	1.9	15.6	4.4	7.3
Concentration, ug/Nm3	ug/Nm3	6.60E-04	4.27E-03	1.15E-03	2.03E-03
Concen., ug/Nm3 @ 12% CO2	ug@12%	8.52E-04	5.96E-03	1.65E-03	2.82E-03
Concen., ug/Nm3 @ 7% O2	ug@7%	8.82E-04	6.12E-03	1.67E-03	2.89E-03
Emission Rate, lb/hr	lb/hr	1.09E-07	7.31E-07	2.09E-07	3.50E-07
Emission Rate, grams/second	g/s	1.37E-08	9.21E-08	2.63E-08	4.41E-08

Benzo[g,h,i]perylene	ng	3.4	38.4	8.5		16.7
Concentration, ug/Nm3	ug/Nm3	1.15E-03	1.05E-02	2.19E-03		4.62E-03
Concen., ug/Nm3 @ 12% CO2	ug@12%	1.48E-03	1.47E-02	3.14E-03		6.43E-03
Concen., ug/Nm3 @ 7% O2	ug@7%	1.54E-03	1.51E-02	3.18E-03		6.60E-03
Emission Rate, lb/hr	lb/hr	1.90E-07	1.80E-06	3.97E-07		7.96E-07
Emission Rate, grams/second	g/s	2.39E-08	2.27E-07	5.01E-08		1.00E-07

Benzo[k]fluoranthene	ng	0.7	1.3	1.7		1.2
Concentration, ug/Nm3	ug/Nm3	2.48E-04	3.62E-04	4.39E-04		3.49E-04
Concen., ug/Nm3 @ 12% CO2	ug@12%	3.20E-04	5.05E-04	6.27E-04		4.84E-04
Concen., ug/Nm3 @ 7% O2	ug@7%	3.31E-04	5.18E-04	6.36E-04		4.95E-04
Emission Rate, lb/hr	lb/hr	4.09E-08	6.19E-08	7.95E-08		6.07E-08
Emission Rate, grams/second	g/s	5.15E-09	7.80E-09	1.00E-08		7.65E-09

Dibenzo[a,h]anthracene	ng	< 4.0	< 4.0	< 4.0		< 4.0
Concentration, ug/Nm3	ug/Nm3	< 1.36E-03	< 1.10E-03	< 1.04E-03		< 1.17E-03
Concen., ug/Nm3 @ 12% CO2	ug@12%	< 1.76E-03	< 1.53E-03	< 1.48E-03		< 1.59E-03
Concen., ug/Nm3 @ 7% O2	ug@7%	< 1.82E-03	< 1.57E-03	< 1.50E-03		< 1.63E-03
Emission Rate, lb/hr	lb/hr	< 2.25E-07	< 1.87E-07	< 1.88E-07		< 2.00E-07
Emission Rate, grams/second	g/s	< 2.83E-08	< 2.36E-08	< 2.37E-08		< 2.52E-08

Fluoranthene	ng	21.9	54.5	51.0		42.5
Concentration, ug/Nm3	ug/Nm3	7.45E-03	1.49E-02	1.32E-02		1.19E-02
Concen., ug/Nm3 @ 12% CO2	ug@12%	9.62E-03	2.08E-02	1.89E-02		1.65E-02
Concen., ug/Nm3 @ 7% O2	ug@7%	9.96E-03	2.14E-02	1.92E-02		1.68E-02
Emission Rate, lb/hr	lb/hr	1.23E-06	2.55E-06	2.40E-06		2.06E-06
Emission Rate, grams/second	g/s	1.55E-07	3.22E-07	3.02E-07		2.60E-07

Fluorene	ng	14.1	10.8	19.9		14.9
Concentration, ug/Nm3	ug/Nm3	4.80E-03	2.96E-03	5.17E-03		4.31E-03
Concen., ug/Nm3 @ 12% CO2	ug@12%	6.19E-03	4.13E-03	7.38E-03		5.90E-03
Concen., ug/Nm3 @ 7% O2	ug@7%	6.41E-03	4.24E-03	7.48E-03		6.05E-03
Emission Rate, lb/hr	lb/hr	7.92E-07	5.06E-07	9.36E-07		7.45E-07
Emission Rate, grams/second	g/s	9.98E-08	6.38E-08	1.18E-07		9.38E-08

Indeno(1,2,3-c,d)pyrene	ng	1.0	7.4	3.1		3.8
Concentration, ug/Nm3	ug/Nm3	3.54E-04	2.03E-03	7.95E-04		1.06E-03
Concen., ug/Nm3 @ 12% CO2	ug@12%	4.57E-04	2.84E-03	1.14E-03		1.48E-03
Concen., ug/Nm3 @ 7% O2	ug@7%	4.73E-04	2.91E-03	1.15E-03		1.51E-03
Emission Rate, lb/hr	lb/hr	5.84E-08	3.48E-07	1.44E-07		1.83E-07
Emission Rate, grams/second	g/s	7.36E-09	4.38E-08	1.81E-08		2.31E-08

2-Methylnaphthalene	ng	28.1	26.5	32.4		29.0
Concentration, ug/Nm3	ug/Nm3	9.56E-03	7.26E-03	8.42E-03		8.41E-03
Concen., ug/Nm3 @ 12% CO2	ug@12%	1.23E-02	1.01E-02	1.20E-02		1.15E-02
Concen., ug/Nm3 @ 7% O2	ug@7%	1.28E-02	1.04E-02	1.22E-02		1.18E-02
Emission Rate, lb/hr	lb/hr	1.58E-06	1.24E-06	1.52E-06		1.45E-06
Emission Rate, grams/second	g/s	1.99E-07	1.56E-07	1.92E-07		1.82E-07

Naphthalene	ng	128.0	150.0	164.0		147.3
Concentration, ug/Nm3	ug/Nm3	4.36E-02	4.11E-02	4.26E-02		4.24E-02
Concen., ug/Nm3 @ 12% CO2	ug@12%	5.62E-02	5.73E-02	6.09E-02		5.81E-02
Concen., ug/Nm3 @ 7% O2	ug@7%	5.82E-02	5.89E-02	6.17E-02		5.96E-02
Emission Rate, lb/hr	lb/hr	7.19E-06	7.03E-06	7.71E-06		7.31E-06
Emission Rate, grams/second	g/s	9.06E-07	8.86E-07	9.72E-07		9.21E-07

Perylene	ng	< 4.0	< 4.0	< 4.0		< 4.0
Concentration, ug/Nm3	ug/Nm3	< 1.36E-03	< 1.10E-03	< 1.04E-03		< 1.17E-03
Concen., ug/Nm3 @ 12% CO2	ug@12%	< 1.76E-03	< 1.53E-03	< 1.48E-03		< 1.59E-03
Concen., ug/Nm3 @ 7% O2	ug@7%	< 1.82E-03	< 1.57E-03	< 1.50E-03		< 1.63E-03
Emission Rate, lb/hr	lb/hr	< 2.25E-07	< 1.87E-07	< 1.88E-07		< 2.00E-07
Emission Rate, grams/second	g/s	< 2.83E-08	< 2.36E-08	< 2.37E-08		< 2.52E-08

Phenanthrene	ng	61.4	71.1	111.0		81.2
Concentration, ug/Nm3	ug/Nm3	2.09E-02	1.95E-02	2.88E-02		2.31E-02
Concen., ug/Nm3 @ 12% CO2	ug@12%	2.70E-02	2.72E-02	4.12E-02		3.18E-02
Concen., ug/Nm3 @ 7% O2	ug@7%	2.79E-02	2.79E-02	4.17E-02		3.25E-02
Emission Rate, lb/hr	lb/hr	3.45E-06	3.33E-06	5.22E-06		4.00E-06
Emission Rate, grams/second	g/s	4.35E-07	4.20E-07	6.58E-07		5.04E-07

Unit 2 FF Outlet
Concentration and Emission Rate Summary
Run Number: 2-O-M23-1

Congener	Concentration			Emission Rate	
	ug/Nm3	ug@12%	ug@7%	lb/hr	grams/sec
Acenaphthene	1.66E-03	2.15E-03	2.22E-03	2.75E-07	3.46E-08
Acenaphthylene	5.27E-04	6.81E-04	7.05E-04	8.71E-08	1.10E-08
Anthracene	1.08E-03	1.40E-03	1.45E-03	1.79E-07	2.25E-08
Benzo[a]anthracene	2.11E-04	2.72E-04	2.82E-04	3.48E-08	4.38E-09
Benzo[a]pyrene	1.96E-04	2.53E-04	2.62E-04	3.24E-08	4.08E-09
Benzo[b]fluoranthene	8.78E-04	1.13E-03	1.17E-03	1.45E-07	1.83E-08
Benzo[e]pyrene	6.60E-04	8.52E-04	8.82E-04	1.09E-07	1.37E-08
Benzo[g,h,i]perylene	1.15E-03	1.48E-03	1.54E-03	1.90E-07	2.39E-08
Benzo[k]fluoranthene	2.48E-04	3.20E-04	3.31E-04	4.09E-08	5.15E-09
Chrysene	6.43E-04	8.30E-04	8.60E-04	1.06E-07	1.34E-08
Dibenzo[a,h]anthracene	<	1.36E-03	< 1.76E-03	< 1.82E-03	< 2.25E-07 < 2.83E-08
Fluoranthene		7.45E-03	9.62E-03	9.96E-03	1.23E-06 1.55E-07
Fluorene		4.80E-03	6.19E-03	6.41E-03	7.92E-07 9.98E-08
Indeno(1,2,3-c,d)pyrene		3.54E-04	4.57E-04	4.73E-04	5.84E-08 7.36E-09
2-Methylnaphthalene		9.56E-03	1.23E-02	1.28E-02	1.58E-06 1.99E-07
Naphthalene		4.36E-02	5.62E-02	5.82E-02	7.19E-06 9.06E-07
Perylene	<	1.36E-03	< 1.76E-03	< 1.82E-03	< 2.25E-07 < 2.83E-08
Phenanthrene		2.09E-02	2.70E-02	2.79E-02	3.45E-06 4.35E-07
Pyrene		5.92E-03	7.64E-03	7.91E-03	9.77E-07 1.23E-07
Total PAHs					
Corrected for artifacts (Acenaphthalene, Naphthalene 2-Methylnaphthalene)	4.77E-02	6.16E-02	6.38E-02	7.88E-06	9.93E-07
Uncorrected PAHs	1.03E-01	1.32E-01	1.37E-01	1.69E-05	2.13E-06

Unit 2 FF Outlet
Concentration and Emission Rate Summary
Run Number: 2-O-M23-2

Congener	Concentration			Emission Rate	
	ug/Nm3	ug@12%	ug@7%	lb/hr	grams/sec
Acenaphthene	1.08E-03	1.51E-03	1.55E-03	1.85E-07	2.33E-08
Acenaphthylene	4.33E-04	6.04E-04	6.20E-04	7.41E-08	9.33E-09
Anthracene	1.11E-03	1.55E-03	1.59E-03	1.90E-07	2.40E-08
Benzo[a]anthracene	3.64E-04	5.08E-04	5.22E-04	6.23E-08	7.85E-09
Benzo[a]pyrene	1.11E-03	1.54E-03	1.59E-03	1.89E-07	2.39E-08
Benzo[b]fluoranthene	1.63E-03	2.27E-03	2.34E-03	2.79E-07	3.51E-08
Benzo[e]pyrene	4.27E-03	5.96E-03	6.12E-03	7.31E-07	9.21E-08
Benzo[g,h,i]perylene	1.05E-02	1.47E-02	1.51E-02	1.80E-06	2.27E-07
Benzo[k]fluoranthene	3.62E-04	5.05E-04	5.18E-04	6.19E-08	7.80E-09
Chrysene	1.00E-03	1.40E-03	1.44E-03	1.72E-07	2.16E-08
Dibenzo[a,h]anthracene	< 1.10E-03	< 1.53E-03	< 1.57E-03	< 1.87E-07	< 2.36E-08
Fluoranthene	1.49E-02	2.08E-02	2.14E-02	2.55E-06	3.22E-07
Fluorene	2.96E-03	4.13E-03	4.24E-03	5.06E-07	6.38E-08
Indeno(1,2,3-c,d)pyrene	2.03E-03	2.84E-03	2.91E-03	3.48E-07	4.38E-08
2-Methylnaphthalene	7.26E-03	1.01E-02	1.04E-02	1.24E-06	1.56E-07
Naphthalene	4.11E-02	5.73E-02	5.89E-02	7.03E-06	8.86E-07
Perylene	< 1.10E-03	< 1.53E-03	< 1.57E-03	< 1.87E-07	< 2.36E-08
Phenanthrene	1.95E-02	2.72E-02	2.79E-02	3.33E-06	4.20E-07
Pyrene	2.09E-02	2.92E-02	3.00E-02	3.58E-06	4.51E-07
Total PAHs					
Corrected for artifacts (Acenaphthalene, Naphthalene 2-Methylnaphthalene)	8.33E-02	1.16E-01	1.19E-01	1.43E-05	1.80E-06
Uncorrected PAHs	1.33E-01	1.85E-01	1.90E-01	2.27E-05	2.86E-06

Unit 2 FF Outlet
Concentration and Emission Rate Summary
Run Number: 2-O-M23-3

Congener	Concentration			Emission Rate	
	ug/Nm3	ug@12%	ug@7%	lb/hr	grams/sec
Acenaphthene	1.50E-03	2.14E-03	2.17E-03	2.71E-07	3.41E-08
Acenaphthylene	9.51E-04	1.36E-03	1.38E-03	1.72E-07	2.17E-08
Anthracene	2.32E-03	3.31E-03	3.36E-03	4.20E-07	5.29E-08
Benzo[a]anthracene	3.12E-04	4.45E-04	4.51E-04	5.64E-08	7.11E-09
Benzo[a]pyrene	3.92E-04	5.60E-04	5.68E-04	7.10E-08	8.95E-09
Benzo[b]fluoranthene	1.23E-03	1.76E-03	1.78E-03	2.23E-07	2.81E-08
Benzo[e]pyrene	1.15E-03	1.65E-03	1.67E-03	2.09E-07	2.63E-08
Benzo[g,h,i]perylene	2.19E-03	3.14E-03	3.18E-03	3.97E-07	5.01E-08
Benzo[k]fluoranthene	4.39E-04	6.27E-04	6.36E-04	7.95E-08	1.00E-08
Chrysene	9.04E-04	1.29E-03	1.31E-03	1.64E-07	2.06E-08
Dibenzo[a,h]anthracene	< 1.04E-03	< 1.48E-03	< 1.50E-03	< 1.88E-07	< 2.37E-08
Fluoranthene	1.32E-02	1.89E-02	1.92E-02	2.40E-06	3.02E-07
Fluorene	5.17E-03	7.38E-03	7.48E-03	9.36E-07	1.18E-07
Indeno(1,2,3-c,d)pyrene	7.95E-04	1.14E-03	1.15E-03	1.44E-07	1.81E-08
2-Methylnaphthalene	8.42E-03	1.20E-02	1.22E-02	1.52E-06	1.92E-07
Naphthalene	4.26E-02	6.09E-02	6.17E-02	7.71E-06	9.72E-07
Perylene	< 1.04E-03	< 1.48E-03	< 1.50E-03	< 1.88E-07	< 2.37E-08
Phenanthrene	2.88E-02	4.12E-02	4.17E-02	5.22E-06	6.58E-07
Pyrene	1.28E-02	1.83E-02	1.85E-02	2.31E-06	2.92E-07
Total PAHs					
Corrected for artifacts (Acenaphthalene, Naphthalene 2-Methylnaphthalene)	7.28E-02	1.04E-01	1.05E-01	1.32E-05	1.66E-06
Uncorrected PAHs	1.25E-01	1.79E-01	1.81E-01	2.27E-05	2.86E-06

Unit 2 FF Outlet
Average Concentration and Emission Rate Summary

Congener	Concentration			Emission Rate	
	ug/Nm3	ug@12%	ug@7%	lb/hr	grams/sec
Acenaphthene	1.41E-03	1.93E-03	1.98E-03	2.43E-07	3.07E-08
Acenaphthylene	6.37E-04	8.81E-04	9.01E-04	1.11E-07	1.40E-08
Anthracene	1.50E-03	2.09E-03	2.13E-03	2.63E-07	3.31E-08
Benzo[a]anthracene	2.96E-04	4.08E-04	4.18E-04	5.12E-08	6.45E-09
Benzo[a]pyrene	5.65E-04	7.86E-04	8.05E-04	9.76E-08	1.23E-08
Benzo[b]fluoranthene	1.25E-03	1.72E-03	1.76E-03	2.16E-07	2.72E-08
Benzo[e]pyrene	2.03E-03	2.82E-03	2.89E-03	3.50E-07	4.41E-08
Benzo[g,h,i]perylene	4.62E-03	6.43E-03	6.60E-03	7.96E-07	1.00E-07
Benzo[k]fluoranthene	3.49E-04	4.84E-04	4.95E-04	6.07E-08	7.65E-09
Chrysene	8.50E-04	1.17E-03	1.20E-03	1.47E-07	1.85E-08
Dibenzo[a,h]anthracene	< 1.17E-03	< 1.59E-03	< 1.63E-03	< 2.00E-07	< 2.52E-08
Fluoranthene	1.19E-02	1.65E-02	1.68E-02	2.06E-06	2.60E-07
Fluorene	4.31E-03	5.90E-03	6.05E-03	7.45E-07	9.38E-08
Indeno(1,2,3-c,d)pyrene	1.06E-03	1.48E-03	1.51E-03	1.83E-07	2.31E-08
2-Methylnaphthalene	8.41E-03	1.15E-02	1.18E-02	1.45E-06	1.82E-07
Naphthalene	4.24E-02	5.81E-02	5.96E-02	7.31E-06	9.21E-07
Perylene	< 1.17E-03	< 1.59E-03	< 1.63E-03	< 2.00E-07	< 2.52E-08
Phenanthrene	2.31E-02	3.18E-02	3.25E-02	4.00E-06	5.04E-07
Pyrene	1.32E-02	1.84E-02	1.88E-02	2.29E-06	2.88E-07
Total PAHs					
Corrected for artifacts (Acenaphthalene, Naphthalene 2-Methylnaphthalene)	6.79E-02	9.39E-02	9.62E-02	1.18E-05	1.48E-06
Uncorrected PAHs	1.20E-01	1.65E-01	1.70E-01	2.08E-05	2.62E-06

ISOKINETIC SAMPLING TRAIN RESULTS - METHOD

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Client Name	Covanta Energy Group, Inc.	Operator	CAN
Plant Name	Huntington Resource Recovery Facility	Project #	10843
Sampling Location	Unit 2 FF Outlet	Standard Temperature, °F	68

USE IN AVERAGE OF RUN SET? 1 or 0 =>	1	1	1	SET AVERAGE
Run Number		2-O-M23-1	2-O-M23-2	
Run Date		08/28/12	08/30/12	
Run Start Time	hh:mm	1333	756	
Run Stop Time	hh:mm	1814	1159	

Sampling Parameters

Meter Calibration Factor	Y	1.0176	1.0065	1.0176	
Y _{OA} Calculated by Test Run	Y _{OA}	0.9795	1.0013	1.0038	
Y _{OA} PASS/FAIL by Test Run	Check	PASS	PASS	PASS	PASS
Pitot Tube Coefficient	C _p	0.84	0.84	0.84	
Stack/Duct Static Pressure	in H ₂ O	-15.00	-15.00	-15.00	-15.00
Stack Cross-Sectional Area	ft ²	21.648	21.648	21.648	21.648
Barometric Pressure	in Hg	29.7	29.9	29.9	29.8
Actual Nozzle Diameter	in	0.197	0.218	0.218	
Carbon Dioxide Percentage	% CO ₂	9.3	8.6	8.4	8.8
Oxygen Percentage	% O ₂	10.5	11.2	11.3	11.0
Carbon Monoxide Percentage	% CO	0.0	0.0	0.0	0.0
Nitrogen Percentage	% N ₂	80.2	80.2	80.3	80.2
Total Water Volume Collected	mL	459.5	567.0	573.5	533.3
Sample Volume	ft ³	106.479	129.473	137.155	124.369
Average Meter Temperature	°F	88	75	83	82
Average Stack Temperature	°F	278	276	278	277
Average Delta H	in H ₂ O	0.56	1.01	0.99	0.85
Total Sampling Time	min	240	240	240	240

Air Flow Parameters

Volume of Water vapor @ STP	SCF	21.629	26.689	26.995	25.104
Volume Metered @ STP	DSCF	103.771	128.891	135.934	122.866
Absolute Stack/Duct Pressure	in Hg	28.6	28.8	28.8	28.7
Absolute Meter Pressure	in Hg	29.7	30.0	30.0	29.9
Calculated Stack Moisture	% H ₂ O	17.2	17.2	16.6	17.0
Saturated Stack Moisture	% H ₂ O	100.0	100.0	100.0	100.0
Reported Stack Moisture Content	% H ₂ O	17.2	17.2	16.6	17.0
Dry Mole Fraction	decimal	0.828	0.828	0.834	0.830
Avg Differential Press. (Delta P)	in H ₂ O	0.753	0.796	0.883	0.811
Dry Gas Molecular Weight	lb/lb-mole	29.91	29.82	29.80	29.84
Wet Stack Gas Molecular Weight	lb/lb-mole	27.85	27.80	27.84	27.83
Average Stack Gas Velocity	ft/sec	59.98	61.44	64.75	62.05
Percent of Isokinetic Rate	% ISO	100.4	98.3	97.9	98.9

Air Flow Rate Results

Actual Stack Flow/Minute	ACFM	77,907	79,799	84,098	80,601
Dry Standard Stack Flow/Minute	DSCFM	44,063	45,670	48,334	46,022

Concentration and Emission Rate Data Summary					
MonoPCBs	pg	7030.000	2040.000	2820.000	3963.333
Concentration, ug/Nm3	ug/Nm3	2.39E-03	5.59E-04	7.33E-04	1.23E-03
Concen., ug/Nm3 @ 12% CO2	ug@12%	3.09E-03	7.80E-04	1.05E-03	1.64E-03
Concen., ug/Nm3 @ 7% O2	ug@7%	3.20E-03	8.01E-04	1.06E-03	1.69E-03
Emission Rate, lb/hr	lb/hr	3.95E-07	9.56E-08	1.33E-07	2.08E-07
Emission Rate, grams/second	g/s	4.98E-08	1.20E-08	1.67E-08	2.62E-08
DiPCBs	pg	17100.000	1990.000	7640.000	8910.000
Concentration, ug/Nm3	ug/Nm3	5.82E-03	5.45E-04	1.98E-03	2.78E-03
Concen., ug/Nm3 @ 12% CO2	ug@12%	7.51E-03	7.61E-04	2.84E-03	3.70E-03
Concen., ug/Nm3 @ 7% O2	ug@7%	7.78E-03	7.81E-04	2.87E-03	3.81E-03
Emission Rate, lb/hr	lb/hr	9.60E-07	9.33E-08	3.59E-07	4.71E-07
Emission Rate, grams/second	g/s	1.21E-07	1.18E-08	4.53E-08	5.93E-08
TriPCBs	pg	16300.000	4500.000	19900.000	13566.667
Concentration, ug/Nm3	ug/Nm3	5.55E-03	1.23E-03	5.17E-03	3.98E-03
Concen., ug/Nm3 @ 12% CO2	ug@12%	7.16E-03	1.72E-03	7.38E-03	5.42E-03
Concen., ug/Nm3 @ 7% O2	ug@7%	7.41E-03	1.77E-03	7.48E-03	5.55E-03
Emission Rate, lb/hr	lb/hr	9.16E-07	2.11E-07	9.36E-07	6.87E-07
Emission Rate, grams/second	g/s	1.15E-07	2.66E-08	1.18E-07	8.66E-08
TetraPCBs	pg	9920.000	6070.000	16100.000	10696.667
Concentration, ug/Nm3	ug/Nm3	3.38E-03	1.66E-03	4.18E-03	3.07E-03
Concen., ug/Nm3 @ 12% CO2	ug@12%	4.36E-03	2.32E-03	5.97E-03	4.22E-03
Concen., ug/Nm3 @ 7% O2	ug@7%	4.51E-03	2.38E-03	6.06E-03	4.32E-03
Emission Rate, lb/hr	lb/hr	5.57E-07	2.85E-07	7.57E-07	5.33E-07
Emission Rate, grams/second	g/s	7.02E-08	3.58E-08	9.54E-08	6.72E-08
PentaPCBs	pg	1980.000	962.000	2080.000	1674.000
Concentration, ug/Nm3	ug/Nm3	6.74E-04	2.64E-04	5.40E-04	4.93E-04
Concen., ug/Nm3 @ 12% CO2	ug@12%	8.69E-04	3.68E-04	7.72E-04	6.70E-04
Concen., ug/Nm3 @ 7% O2	ug@7%	9.00E-04	3.78E-04	7.82E-04	6.87E-04
Emission Rate, lb/hr	lb/hr	1.11E-07	4.51E-08	9.78E-08	8.47E-08
Emission Rate, grams/second	g/s	1.40E-08	5.68E-09	1.23E-08	1.07E-08
HexaPCBs	pg	957.000	666.000	848.000	823.667
Concentration, ug/Nm3	ug/Nm3	3.26E-04	1.82E-04	2.20E-04	2.43E-04
Concen., ug/Nm3 @ 12% CO2	ug@12%	4.20E-04	2.55E-04	3.15E-04	3.30E-04
Concen., ug/Nm3 @ 7% O2	ug@7%	4.35E-04	2.61E-04	3.19E-04	3.39E-04
Emission Rate, lb/hr	lb/hr	5.38E-08	3.12E-08	3.99E-08	4.16E-08
Emission Rate, grams/second	g/s	6.77E-09	3.93E-09	5.03E-09	5.24E-09
HeptaPCBs	pg	809.000	500.000	457.000	588.667
Concentration, ug/Nm3	ug/Nm3	2.75E-04	1.37E-04	1.19E-04	1.77E-04
Concen., ug/Nm3 @ 12% CO2	ug@12%	3.55E-04	1.91E-04	1.70E-04	2.39E-04
Concen., ug/Nm3 @ 7% O2	ug@7%	3.68E-04	1.96E-04	1.72E-04	2.45E-04
Emission Rate, lb/hr	lb/hr	4.54E-08	2.34E-08	2.15E-08	3.01E-08
Emission Rate, grams/second	g/s	5.73E-09	2.95E-09	2.71E-09	3.80E-09

OctaPCBs	pg	267.000	171.000	165.000		201.000
Concentration, ug/Nm3	ug/Nm3	9.09E-05	4.68E-05	4.29E-05		6.02E-05
Concen., ug/Nm3 @ 12% CO2	ug@12%	1.17E-04	6.54E-05	6.12E-05		8.13E-05
Concen., ug/Nm3 @ 7% O2	ug@7%	1.21E-04	6.71E-05	6.21E-05		8.35E-05
Emission Rate, lb/hr	lb/hr	1.50E-08	8.01E-09	7.76E-09		1.03E-08
Emission Rate, grams/second	g/s	1.89E-09	1.01E-09	9.78E-10		1.29E-09

NonaPCBs	pg	23.900	< 8.470	19.200		< 17.190
Concentration, ug/Nm3	ug/Nm3	8.13E-06	< 2.32E-06	4.99E-06		< 5.15E-06
Concen., ug/Nm3 @ 12% CO2	ug@12%	1.05E-05	< 3.24E-06	7.12E-06		< 6.95E-06
Concen., ug/Nm3 @ 7% O2	ug@7%	1.09E-05	< 3.33E-06	7.22E-06		< 7.14E-06
Emission Rate, lb/hr	lb/hr	1.34E-09	< 3.97E-10	9.03E-10		< 8.81E-10
Emission Rate, grams/second	g/s	1.69E-10	< 5.00E-11	1.14E-10		< 1.11E-10

DecaPCBs	pg	< 4.500	< 5.160	< 3.870		< 4.510
Concentration, ug/Nm3	ug/Nm3	< 1.53E-06	< 1.41E-06	< 1.01E-06		< 1.32E-06
Concen., ug/Nm3 @ 12% CO2	ug@12%	< 1.98E-06	< 1.97E-06	< 1.44E-06		< 1.79E-06
Concen., ug/Nm3 @ 7% O2	ug@7%	< 2.05E-06	< 2.03E-06	< 1.46E-06		< 1.84E-06
Emission Rate, lb/hr	lb/hr	< 2.53E-10	< 2.42E-10	< 1.82E-10		< 2.26E-10
Emission Rate, grams/second	g/s	< 3.18E-11	< 3.05E-11	< 2.29E-11		< 2.84E-11

Unit 2 FF Outlet
Concentration and Emission Rate Summary
Run Number: 2-O-M23-1

Congener	Concentration			Emission Rate	
	ug/Nm3	ug@12%	ug@7%	lb/hr	grams/sec
MonoPCBs	2.39E-03	3.09E-03	3.20E-03	3.95E-07	4.98E-08
DiPCBs	5.82E-03	7.51E-03	7.78E-03	9.60E-07	1.21E-07
TriPCBs	5.55E-03	7.16E-03	7.41E-03	9.16E-07	1.15E-07
TetraPCBs	3.38E-03	4.36E-03	4.51E-03	5.57E-07	7.02E-08
PentaPCBs	6.74E-04	8.69E-04	9.00E-04	1.11E-07	1.40E-08
HexaPCBs	3.26E-04	4.20E-04	4.35E-04	5.38E-08	6.77E-09
HeptaPCBs	2.75E-04	3.55E-04	3.68E-04	4.54E-08	5.73E-09
OctaPCBs	9.09E-05	1.17E-04	1.21E-04	1.50E-08	1.89E-09
NonaPCBs	8.13E-06	1.05E-05	1.09E-05	1.34E-09	1.69E-10
DecaPCBs	< 1.53E-06	< 1.98E-06	< 2.05E-06	< 2.53E-10	< 3.18E-11
TOTAL PCBs	< 1.85E-02	< 2.39E-02	< 2.47E-02	< 3.05E-06	< 3.85E-07

Unit 2 FF Outlet
Concentration and Emission Rate Summary
Run Number: 2-O-M23-2

Congener	Concentration			Emission Rate	
	ug/Nm3	ug@12%	ug@7%	lb/hr	grams/sec
MonoPCBs	5.59E-04	7.80E-04	8.01E-04	9.56E-08	1.20E-08
DiPCBs	5.45E-04	7.61E-04	7.81E-04	9.33E-08	1.18E-08
TriPCBs	1.23E-03	1.72E-03	1.77E-03	2.11E-07	2.66E-08
TetraPCBs	1.66E-03	2.32E-03	2.38E-03	2.85E-07	3.58E-08
PentaPCBs	2.64E-04	3.68E-04	3.78E-04	4.51E-08	5.68E-09
HexaPCBs	1.82E-04	2.55E-04	2.61E-04	3.12E-08	3.93E-09
HeptaPCBs	1.37E-04	1.91E-04	1.96E-04	2.34E-08	2.95E-09
OctaPCBs	4.68E-05	6.54E-05	6.71E-05	8.01E-09	1.01E-09
NonaPCBs	<	2.32E-06	< 3.24E-06	< 3.33E-06	< 3.97E-10
DecaPCBs	<	1.41E-06	< 1.97E-06	< 2.03E-06	< 2.42E-10
TOTAL PCBs	<	4.63E-03	< 6.47E-03	< 6.64E-03	< 7.93E-07
					9.99E-08

Unit 2 FF Outlet
Concentration and Emission Rate Summary
Run Number: 2-O-M23-3

Congener	Concentration			Emission Rate	
	ug/Nm3	ug@12%	ug@7%	lb/hr	grams/sec
MonoPCBs	7.33E-04	1.05E-03	1.06E-03	1.33E-07	1.67E-08
DiPCBs	1.98E-03	2.84E-03	2.87E-03	3.59E-07	4.53E-08
TriPCBs	5.17E-03	7.38E-03	7.48E-03	9.36E-07	1.18E-07
TetraPCBs	4.18E-03	5.97E-03	6.06E-03	7.57E-07	9.54E-08
PentaPCBs	5.40E-04	7.72E-04	7.82E-04	9.78E-08	1.23E-08
HexaPCBs	2.20E-04	3.15E-04	3.19E-04	3.99E-08	5.03E-09
HeptaPCBs	1.19E-04	1.70E-04	1.72E-04	2.15E-08	2.71E-09
OctaPCBs	4.29E-05	6.12E-05	6.21E-05	7.76E-09	9.78E-10
NonaPCBs	4.99E-06	7.12E-06	7.22E-06	9.03E-10	1.14E-10
DecaPCBs	< 1.01E-06	< 1.44E-06	< 1.46E-06	< 1.82E-10	< 2.29E-11
TOTAL PCBs	< 1.30E-02	< 1.86E-02	< 1.88E-02	< 2.35E-06	< 2.97E-07

Unit 2 FF Outlet
Average Concentration and Emission Rate Summary

Congener	Concentration			Emission Rate		
	ug/Nm3	ug@12%	ug@7%	lb/hr	grams/sec	
MonoPCBs	1.23E-03	1.64E-03	1.69E-03	2.08E-07	2.62E-08	
DiPCBs	2.78E-03	3.70E-03	3.81E-03	4.71E-07	5.93E-08	
TriPCBs	3.98E-03	5.42E-03	5.55E-03	6.87E-07	8.66E-08	
TetraPCBs	3.07E-03	4.22E-03	4.32E-03	5.33E-07	6.72E-08	
PentaPCBs	4.93E-04	6.70E-04	6.87E-04	8.47E-08	1.07E-08	
HexaPCBs	2.43E-04	3.30E-04	3.39E-04	4.16E-08	5.24E-09	
HeptaPCBs	1.77E-04	2.39E-04	2.45E-04	3.01E-08	3.80E-09	
OctaPCBs	6.02E-05	8.13E-05	8.35E-05	1.03E-08	1.29E-09	
NonaPCBs	<	5.15E-06	< 6.95E-06	< 7.14E-06	< 8.81E-10	< 1.11E-10
DecaPCBs	<	1.32E-06	< 1.79E-06	< 1.84E-06	< 2.26E-10	< 2.84E-11
TOTAL PCBs	<	1.20E-02	< 1.63E-02	< 1.67E-02	< 2.07E-06	< 2.60E-07

APPENDIX A.13
Test Results

Unit 2 FF Outlet
Formaldehyde

ISOKINETIC SAMPLING TRAIN RESULTS - METHOD:

M316

Client Name	Covanta Energy Group, Inc.	Operator	SGD
Plant Name	Huntington Resource Recovery Facility	Project #	10843
Sampling Location	Unit 2 FF Outlet	Standard Temperature, °F	68

USE IN AVERAGE OF RUN SET? 1 or 0 =>	1	1	1	SET AVERAGE
Run Number	2-O-M316-1	2-O-M316-2	2-O-M316-3	
Run Date	08/29/12	08/29/12	08/29/12	
Run Start Time	hh:mm	923	1209	
Run Stop Time	hh:mm	1025	1313	

Sampling Parameters

Meter Calibration Factor	Y	1.0065	1.0065	1.0065	
Y_{OA} Calculated by Test Run	Y _{OA}	1.0070	0.9860	0.9974	
Y_{OA} PASS/FAIL by Test Run	Check	PASS	PASS	PASS	PASS
Pitot Tube Coefficient	C _p	0.84	0.84	0.84	
Stack/Duct Static Pressure	in H ₂ O	-15.00	-14.80	-15.30	-15.03
Stack Cross-Sectional Area	ft ²	21.648	21.648	21.648	21.648
Barometric Pressure	in Hg	29.8	29.8	29.8	29.8
Actual Nozzle Diameter	in	0.218	0.216	0.218	
Carbon Dioxide Percentage	% CO ₂	8.4	8.4	8.5	8.4
Oxygen Percentage	% O ₂	11.3	11.3	11.3	11.3
Carbon Monoxide Percentage	% CO	0.0	0.0	0.0	0.0
Nitrogen Percentage	% N ₂	80.3	80.3	80.2	80.3
Total Water Volume Collected	mL	142.7	135.9	137.5	138.7
Sample Volume	ft ³	33.128	33.423	34.172	33.574
Average Meter Temperature	°F	78	79	81	79
Average Stack Temperature	°F	277	277	277	277
Average Delta H	in H ₂ O	1.06	1.02	1.09	1.06
Total Sampling Time	min	60	60	60	60

Air Flow Parameters

Volume of Water vapor @ STP	SCF	6.717	6.397	6.472	6.529
Volume Metered @ STP	DSCF	32.640	32.913	33.524	33.026
Absolute Stack/Duct Pressure	in Hg	28.7	28.7	28.7	28.7
Absolute Meter Pressure	in Hg	29.9	29.9	29.9	29.9
Calculated Stack Moisture	% H ₂ O	17.1	16.3	16.2	16.5
Dry Mole Fraction	decimal	0.829	0.837	0.838	0.835
Avg Differential Pressure (Delta P)	in H ₂ O	0.835	0.843	0.868	0.849
Dry Gas Molecular Weight	lb/lb-mole	29.80	29.80	29.81	29.80
Wet Stack Gas Molecular Weight	lb/lb-mole	27.78	27.88	27.90	27.85
Average Stack Gas Velocity	ft/sec	63.07	63.27	64.21	63.51
Percent of Isokinetic Rate	% ISO	97.3	98.7	97.2	97.7

Air Flow Rate Results

Actual Stack Flow/Minute	ACFM	81,917	82,179	83,395	82,497
Dry Standard Stack Flow/Minute	DSCFM	46,703	47,325	48,010	47,346

Concentration and Emission Rate Data Summary

Formaldehyde	ug	23.0 < 9.49	20.7		
Molecular Weight	MW	30.03	30.03	30.03	
Concentration ug/DSCM	ug/DSCM	24.9 < 10.2	21.8	< 19.0	
Concentration @ 12% CO₂	ug@12%	35.5 < 14.5	30.8	< 27.0	
Concentration @ 7% O₂	ug@7%	36.0 < 14.7	31.6	< 27.4	
Emission Rate, lb/hr	lb/hr	4.35E-03 < 1.80E-03	3.92E-03	< 3.36E-03	

APPENDIX A.14
Test Results

Unit 2 FF Outlet
Particulate and Metals

ISOKINETIC SAMPLING TRAIN RESULTS - METHOD

M29

Client Name	Covanta Energy Group, Inc.			Operator	JMA
Plant Name	Huntington Resource Recovery Facility			Project #	10843
Sampling Location	Unit 2 FF Outlet			Standard Temperature, °F	68
USE IN AVERAGE OF RUN SET? 1 or 0 =>	1	1	1	SET AVERAGE	
Run Number		2-O-M29-1	2-O-M29-2		
Run Date		09/06/12	09/06/12		
Run Start Time	hh:mm	814	1043		
Run Stop Time	hh:mm	1024	1257		
Sampling Parameters					
Meter Calibration Factor	Y	1.0176	1.0176	1.0176	
Y _{OA} Calculated by Test Run	Y _{OA}	1.0041	1.0027	1.0000	
Y _{OA} PASS/FAIL by Test Run	Check	PASS	PASS	PASS	PASS
Pitot Tube Coefficient	C _p	0.84	0.84	0.84	
Stack/Duct Static Pressure	in H ₂ O	-15.50	-15.50	-15.50	-15.50
Stack Cross-Sectional Area	ft ²	21.648	21.648	21.648	21.648
Barometric Pressure	in Hg	29.8	29.8	29.8	29.8
Actual Nozzle Diameter	in	0.218	0.218	0.218	
Carbon Dioxide Percentage	% CO ₂	8.9	8.5	8.4	8.6
Oxygen Percentage	% O ₂	10.9	11.1	11.3	11.1
Carbon Monoxide Percentage	% CO	0.0	0.0	0.0	0.0
Nitrogen Percentage	% N ₂	80.2	80.4	80.3	80.3
Total Water Volume Collected	mL	335.7	313.5	306.1	318.4
Sample Volume	ft ³	65.417	66.294	65.382	65.698
Average Meter Temperature	°F	81	85	87	84
Average Stack Temperature	°F	278	279	279	279
Average Delta H	in H ₂ O	0.89	0.90	0.87	0.89
Total Sampling Time	min	120	120	120	120
Air Flow Parameters					
Volume of Water vapor @ STP	SCF	15.801	14.756	14.408	14.989
Volume Metered @ STP	DSCF	64.869	65.206	64.020	64.698
Absolute Stack/Duct Pressure	in Hg	28.7	28.7	28.7	28.7
Absolute Meter Pressure	in Hg	29.9	29.9	29.9	29.9
Calculated Stack Moisture	% H ₂ O	19.6	18.5	18.4	18.8
Saturated Stack Moisture	% H ₂ O	100.0	100.0	100.0	100.0
Reported Stack Moisture Content	% H ₂ O	19.6	18.5	18.4	18.8
Dry Mole Fraction	decimal	0.804	0.815	0.816	0.812
Avg Differential Pressure (Delta P)	in H ₂ O	0.809	0.819	0.789	0.806
Dry Gas Molecular Weight	lb/lb-mole	29.86	29.80	29.80	29.82
Wet Stack Gas Molecular Weight	lb/lb-mole	27.54	27.63	27.63	27.60
Average Stack Gas Velocity	ft/sec	62.45	62.77	61.63	62.29
Percent of Isokinetic Rate	% ISO	101.1	99.7	99.7	100.2
Air Flow Rate Results					
Actual Stack Flow/Minute	ACFM	81,111	81,537	80,055	80,901
Dry Standard Stack Flow/Minute	DSCFM	44,697	45,524	44,709	44,976

Concentration and Emission Rate Data Summary						
Filterable Particulate	mg	0.1	1.2	0.6		0.6
Concentration, Gr/DSCF	gr/DSCF	2.38E-05	2.84E-04	1.45E-04		1.51E-04
Concentration @ 12% CO ₂	Gr@12%	3.21E-05	4.01E-04	2.07E-04		2.13E-04
Concentration @ 7% O ₂	Gr@7%	3.31E-05	4.03E-04	2.09E-04		2.15E-04
Concentration mg/DSCM	mg/DSCM	0.0544	0.650	0.331		0.345
Concentration mg @ 7% O ₂	mg@7%	0.0757	0.922	0.479		0.492
Emission Rate, lb/hr	lb/hr	0.0091	0.111	0.0554		0.0585
Arsenic (As)	ug	< 0.200	< 0.200	< 0.200		< 0.200
Concentration ug/DSCM	ug/DSCM	< 0.109	< 0.108	< 0.110		< 0.109
Concentration ug @ 12% CO ₂	ug@12%	< 0.147	< 0.153	< 0.158		< 0.152
Concentration ug @ 7% O ₂	ug@7%	< 0.151	< 0.154	< 0.160		< 0.155
Emission Rate, lb/hr	lb/hr	< 1.82E-05	< 1.85E-05	< 1.85E-05		< 1.84E-05
Beryllium (Be)	ug	< 0.050	< 0.050	< 0.050		< 0.050
Concentration ug/DSCM	ug/DSCM	< 0.0272	< 0.0271	< 0.0276		< 0.0273
Concentration ug @ 12% CO ₂	ug@12%	< 0.0367	< 0.0382	< 0.0394		< 0.0381
Concentration ug @ 7% O ₂	ug@7%	< 0.0378	< 0.0384	< 0.0399		< 0.0387
Emission Rate, lb/hr	lb/hr	< 4.56E-06	< 4.62E-06	< 4.62E-06		< 4.60E-06
Cadmium (Cd)	ug	< 0.200	0.339	< 0.200		< 0.246
Concentration ug/DSCM	ug/DSCM	< 0.109	0.183	< 0.110		< 0.134
Concentration ug @ 12% CO ₂	ug@12%	< 0.147	0.259	< 0.158		< 0.188
Concentration ug @ 7% O ₂	ug@7%	< 0.151	0.260	< 0.160		< 0.190
Emission Rate, lb/hr	lb/hr	< 1.82E-05	3.13E-05	< 1.85E-05		< 2.27E-05
Total Chromium (Cr)	ug	2.890	2.545	2.700		2.712
Concentration ug/DSCM	ug/DSCM	1.57	1.38	1.49		1.48
Concentration ug @ 12% CO ₂	ug@12%	2.12	1.95	2.13		2.06
Concentration ug @ 7% O ₂	ug@7%	2.19	1.95	2.16		2.10
Emission Rate, lb/hr	lb/hr	2.63E-04	2.35E-04	2.49E-04		2.49E-04
Lead (Pb)	ug	3.210	14.700	1.750		6.553
Concentration ug/DSCM	ug/DSCM	1.75	7.96	0.97		3.56
Concentration ug @ 12% CO ₂	ug@12%	2.36	11.2	1.38		4.99
Concentration ug @ 7% O ₂	ug@7%	2.43	11.3	1.40		5.04
Emission Rate, lb/hr	lb/hr	2.93E-04	1.36E-03	1.62E-04		6.04E-04
Manganese (Mn)	ug	3.300	3.050	2.750		3.033
Concentration ug/DSCM	ug/DSCM	1.80	1.65	1.52		1.65
Concentration ug @ 12% CO ₂	ug@12%	2.42	2.33	2.17		2.31
Concentration ug @ 7% O ₂	ug@7%	2.50	2.34	2.20		2.35
Emission Rate, lb/hr	lb/hr	3.01E-04	2.82E-04	2.54E-04		2.79E-04
Mercury (Hg)	ug	< 1.800	< 1.800	< 1.800		< 1.800
Concentration ug/DSCM	ug/DSCM	< 0.980	< 0.975	< 0.993		< 0.982
Concentration ug @ 12% CO ₂	ug@12%	< 1.32	< 1.38	< 1.42		< 1.37
Concentration ug @ 7% O ₂	ug@7%	< 1.36	< 1.38	< 1.44		< 1.39
Emission Rate, lb/hr	lb/hr	< 1.64E-04	< 1.66E-04	< 1.66E-04		< 1.66E-04

Nickel (Ni)	ug	4.770	6.320	3.260		4.783
Concentration ug/DSCM	ug/DSCM	2.60	3.42	1.80		2.61
Concentration ug @ 12% CO₂	ug@12%	3.50	4.83	2.57		3.63
Concentration ug @ 7% O₂	ug@7%	3.61	4.85	2.60		3.69
Emission Rate, lb/hr	lb/hr	4.35E-04	5.84E-04	3.01E-04		4.40E-04

Vanadium (V)	ug	< 0.200	< 0.200	< 0.200		< 0.200
Concentration ug/DSCM	ug/DSCM	< 0.109	< 0.108	< 0.110		< 0.109
Concentration ug @ 12% CO₂	ug@12%	< 0.147	< 0.153	< 0.158		< 0.152
Concentration ug @ 7% O₂	ug@7%	< 0.151	< 0.154	< 0.160		< 0.155
Emission Rate, lb/hr	lb/hr	< 1.82E-05	< 1.85E-05	< 1.85E-05		< 1.84E-05

Zinc (Zn)	ug	24.300	41.900	30.200		32.133
Concentration ug/DSCM	ug/DSCM	13.2	22.7	16.7		17.5
Concentration ug @ 12% CO₂	ug@12%	17.8	32.0	23.8		24.6
Concentration ug @ 7% O₂	ug@7%	18.4	32.2	24.1		24.9
Emission Rate, lb/hr	lb/hr	2.21E-03	3.87E-03	2.79E-03		2.96E-03

Removal Efficiency Summary For: Mercury

Unit #	Repetition Number	ug/DSCM @ 7% O2		Removal Efficiency, %
		Inlet Result	Stack Result	
2	1	< 64.7	< 1.36	97.9%
	2	< 49.4	< 1.38	97.2%
	3	< 66.7	< 1.44	97.8%
AVERAGE =>				97.6%

APPENDIX A.15
Test Results

Unit 2 FF Outlet
PM10

ISOKINETIC SAMPLING TRAIN RESULTS - METHOD:

M201A

Client Name	Covanta Energy Group, Inc.	Operator	WES
Plant Name	Huntington Resource Recovery Facility	Project #	10843
Sampling Location	Unit 2 FF Outlet	Standard Temperature, °F	68

USE IN AVERAGE OF RUN SET? 1 or 0 =>	1	1	1	SET AVERAGE
Run Number		2-O-M201A-1	2-O-M201A-2	
Run Date		08/28/12	08/28/12	
Run Start Time	hh:mm	904	1210	
Run Stop Time	hh:mm	1113	1410	1717

Sampling Parameters

Meter Calibration Factor	Y	1.0065	1.0065	1.0065	
Y _{QA} Calculated by Test Run	Y _{QA}	1.0005	1.0011	0.9724	
Y _{QA} PASS/FAIL by Test Run	Check	PASS	PASS	PASS	PASS
Pitot Tube Coefficient	C _p	0.7617	0.7382	0.7617	
Stack/Duct Static Pressure	in H ₂ O	-15.00	-15.00	-15.00	-15.00
Stack Cross-Sectional Area	ft ²	21.65	21.65	21.65	21.65
Barometric Pressure	in Hg	29.7	29.7	29.7	29.7
Actual Nozzle Diameter	in	0.165	0.168	0.165	
Carbon Dioxide Percentage	% CO ₂	9.4	9.3	9.4	9.4
Oxygen Percentage	% O ₂	10.4	10.5	10.4	10.4
Carbon Monoxide Percentage	% CO	0.0	0.0	0.0	0.0
Nitrogen Percentage	% N ₂	80.2	80.2	80.2	80.2
Total Water Volume Collected	mL	168.0	186.5	164.2	172.9
Sample Volume	ft ³	41.448	39.845	44.855	42.049
Average Meter Temperature	°F	81	84	88	84
Average Stack Temperature	°F	277	277	278	277
Average Delta H	in H ₂ O	0.39	0.39	0.40	0.39
Total Sampling Time	min	121.00	116.00	125.25	120.75

Air Flow Parameters

Volume of Water vapor @ STP	SCF	7.908	8.779	7.729	8.138
Volume Metered @ STP	DSCF	40.480	38.649	43.251	40.793
Absolute Stack/Duct Pressure	in Hg	28.6	28.6	28.6	28.6
Absolute Meter Pressure	in Hg	29.7	29.7	29.7	29.7
Calculated Stack Moisture	% H ₂ O	16.3	18.5	15.2	16.7
Reported Stack Moisture Content	% H ₂ O	16.3	18.5	15.2	16.7
Dry Mole Fraction	decimal	0.837	0.815	0.848	0.833
Avg Differential Pressure (Delta P)	in H ₂ O	1.075	1.076	1.108	1.086
Dry Gas Molecular Weight	lb/lb-mole	29.92	29.91	29.92	29.92
Wet Stack Gas Molecular Weight	lb/lb-mole	27.97	27.70	28.11	27.93
Average Stack Gas Velocity	ft/sec	64.81	63.16	65.66	64.55
Percent of Isokinetic Rate	% ISO	101.1	102.4	101.8	101.8

Air Flow Rate Results

Actual Stack Flow/Minute	ACFM	84,189	82,050	85,296	83,845
Dry Standard Stack Flow/Minute	DSCFM	48,232	45,763	49,478	47,824
Dry Standard Flow/Minute @ 7% O ₂	DSCFM7	36,434	34,240	37,376	36,017

Cyclone Calculations					
Sample Flow Rate at Standard Conds.	Q _{sST}	0.335	0.333	0.345	0.338
Cyclone Flow at Actual Conditons	Q _s	0.584	0.597	0.595	0.592
Flue Gas Viscosity, micropoise	μ	213.7	211.9	215.0	213.5
Reynolds Number	N _{re}	2563	2617	2605	2595
PM 10 Particle Cut Size	D ₅₀	10.09	9.90	9.99	9.99
Cunningham Correction Factor	C	1.088	1.087	1.088	1.088

QA/QC Calculations					
%ISO Results, 80%<I<120%	ISO %	YES	YES	YES	YES
PM10 Cut Size, 9um<D ₅₀ <11um	PM10	YES	YES	YES	YES
% of Catch <10um	%	32.3	75.0	35.3	47.5

Concentration and Emission Rate Data Summary					
Particulate Fraction <10 microns	mg	1.0	0.3	0.6	0.6
Concentration, Gr/DSCF	gr/DSCF	3.81E-04	1.20E-04	2.14E-04	2.38E-04
Concentration, Gr/DSCF @ 7% O ₂	Gr@7%	5.05E-04	1.60E-04	2.83E-04	3.16E-04
Concentration, mg/DSCM	mg/DSCM	0.872	0.274	0.490	0.545
Concentration, mg/DSCM @ 7% O ₂	mg@7%	1.15	0.366	0.648	0.723
Emission Rate, lb/hr	lb/hr	0.158	0.0470	0.0908	0.0985

Particulate Fraction >10 microns	mg	2.1	0.1	1.1	1.1
Concentration, Gr/DSCF	gr/DSCF	8.01E-04	3.99E-05	3.92E-04	4.11E-04
Concentration, Gr/DSCF @ 7% O ₂	Gr@7%	1.06E-03	5.34E-05	5.20E-04	5.44E-04
Concentration, mg/DSCM	mg/DSCM	1.83	0.0914	0.898	0.940
Concentration, mg/DSCM @ 7% O ₂	mg@7%	2.43	0.122	1.19	1.25
Emission Rate, lb/hr	lb/hr	0.331	0.0157	0.166	0.171

Total Filterable Particulate	mg	3.1	0.4	1.7	1.7
Concentration, Gr/DSCF	gr/DSCF	1.18E-03	1.60E-04	6.07E-04	6.49E-04
Concentration, Gr/DSCF @ 7% O ₂	Gr@7%	1.56E-03	2.13E-04	8.03E-04	8.60E-04
Concentration, mg/DSCM	mg/DSCM	2.70	0.365	1.39	1.49
Concentration, mg/DSCM @ 7% O ₂	mg@7%	3.58	0.488	1.84	1.97
Emission Rate, lb/hr	lb/hr	0.489	0.0627	0.257	0.269

APPENDIX A.16
Test Results

Unit 2 FF Outlet
Sulfuric Acid Mist

ISOKINETIC SAMPLING TRAIN RESULTS - METHOD:

M8

Client Name	Covanta Energy Group, Inc.	Operator	SGD
Plant Name	Huntington Resource Recovery Facility	Project #	10843
Sampling Location	Unit 2 FF Outlet	Standard Temperature, °F	68

USE IN AVERAGE OF RUN SET? 1 or 0 =>	1	1	1	SET AVERAGE
Run Number		2-O-M8-1	2-O-M8-2	
Run Date		08/29/12	08/29/12	
Run Start Time	hh:mm	800	1038	
Run Stop Time	hh:mm	904	1142	1438

Sampling Parameters

Meter Calibration Factor	Y	1.0065	1.0065	1.0065	
Y_{QA} Calculated by Test Run	Y _{QA}	0.9985	1.0063	1.0062	
Y_{QA} PASS/FAIL by Test Run	Check	PASS	PASS	PASS	PASS
Pitot Tube Coefficient	C _p	0.84	0.84	0.84	
Stack/Duct Static Pressure	in H ₂ O	-15.20	-15.20	-15.00	-15.13
Stack Cross-Sectional Area	ft ²	21.648	21.648	21.648	21.648
Barometric Pressure	in Hg	29.8	29.8	29.8	29.8
Actual Nozzle Diameter	in	0.218	0.218	0.218	
Carbon Dioxide Percentage	% CO ₂	8.5	8.6	8.7	8.6
Oxygen Percentage	% O ₂	11.3	11.2	11.1	11.2
Carbon Monoxide Percentage	% CO	0.0	0.0	0.0	0.0
Nitrogen Percentage	% N ₂	80.2	80.2	80.2	80.2
Total Water Volume Collected	mL	136.0	128.1	131.0	131.7
Sample Volume	ft ³	34.452	31.931	32.612	32.998
Average Meter Temperature	°F	77	79	79	79
Average Stack Temperature	°F	276	277	277	277
Average Delta H	in H ₂ O	1.13	0.98	1.02	1.04
Total Sampling Time	min	60	60	60	60

Air Flow Parameters

Volume of Water vapor @ STP	SCF	6.402	6.030	6.166	6.199
Volume Metered @ STP	DSCF	34.028	31.396	32.090	32.505
Absolute Stack/Duct Pressure	in Hg	28.7	28.7	28.7	28.7
Absolute Meter Pressure	in Hg	29.9	29.9	29.9	29.9
Calculated Stack Moisture	% H ₂ O	15.8	16.1	16.1	16.0
Dry Mole Fraction	decimal	0.842	0.839	0.839	0.840
Avg Differential Pressure (Delta P)	in H ₂ O	0.890	0.774	0.808	0.824
Dry Gas Molecular Weight	lb/lb-mole	29.81	29.82	29.84	29.82
Wet Stack Gas Molecular Weight	lb/lb-mole	27.94	27.92	27.93	27.93
Average Stack Gas Velocity	ft/sec	64.93	60.62	61.91	62.49
Percent of Isokinetic Rate	% ISO	97.1	96.4	96.4	96.6

Air Flow Rate Results

Actual Stack Flow/Minute	ACFM	84,336	78,741	80,412	81,163
Dry Standard Stack Flow/Minute	DSCFM	48,799	45,355	46,356	46,837

Concentration and Emission Rate Data Summary

Sulfuric Acid Mist	mg	< 0.119	< 0.120	< 0.132	
Molecular Weight	MW	98.08	98.08	98.08	
Concentration, ppm	ppm	< 0.0303	< 0.0331	< 0.0356	< 0.0330
Concentration @ 12% CO₂	ppm@12%	< 0.0428	< 0.0462	< 0.0491	< 0.0460
Concentration @ 7% O₂	ppm@7%	< 0.0439	< 0.0474	< 0.0505	< 0.0473
Emission Rate, lb/hr	lb/hr	< 0.0226	< 0.0229	< 0.0252	< 0.0236

APPENDIX A.17
Test Results

Unit 2 FF Outlet
Total Hydrocarbons as Ethane

CONCENTRATION AND EMISSION RATE DATA SUMMARY

Client Name	Covanta Energy Group, Inc.
Plant Name	Huntington Resource Recovery
Sampling Location	Unit 2 SDA Inlet
Sampling Location	Unit 2 FF Outlet
Operator	10843
Project #	CMW

USE IN AVERAGE OF RUN SET? 1 or 0 =>	1	1	1	
CEM Run Number	1	2	3	
Run Date	08/29/12	08/29/12	08/29/12	
Run Start Time	hh:mm	805	840	916
Run Stop Time	hh:mm	829	904	940
Moisture Content	% H ₂ O	15.8	15.8	17.1
Dry Mole Fraction	Mfd	0.842	0.842	0.829
Carbon Dioxide Percentage	% CO ₂	8.198	8.676	8.773
Oxygen Percentage	% O ₂	11.397	11.015	10.765
Dry Standard Stack Flow Rate	DSCFM	48,799	48,799	46,703
Air Flow and Moisture Taken From Test Run =>	2-O-M8-1	2-O-M8-1	2-O-M316-1	

Unit 2 FF Outlet	
Total Hydrocarbons (as Ethane)	
Formula Weight	Fwt
Concentration, ppm (wet)	ppmvw
Concentration, ppm (dry)	ppmvd
Concentration, ppm@7%O₂	ppm@7%O ₂
Concentration, ppm@12%CO₂	ppm@12%CO ₂
Emission Rate, lb/hr	lb/hr

CONCENTRATION AND EMISSION RATE DATA SUMMARY

Client Name	Covanta Energy Group, Inc.
Plant Name	Huntington Resource Recovery
Sampling Location	Unit 2 SDA Inlet
Sampling Location	Unit 2 FF Outlet
Operator	10843
Project #	CMW

USE IN AVERAGE OF RUN SET? 1 or 0 =>		1	1	1	
CEM Run Number		4	5	6	
Run Date		08/29/12	08/29/12	08/29/12	
Run Start Time	hh:mm	952	1035	1112	SET AVERAGE
Run Stop Time	hh:mm	1016	1059	1136	
Moisture Content	% H ₂ O	17.1	16.1	16.1	16.4
Dry Mole Fraction	Mfd	0.829	0.839	0.839	0.836
Carbon Dioxide Percentage	% CO ₂	8.219	8.099	7.938	8.085
Oxygen Percentage	% O ₂	11.455	11.455	11.550	11.487
Dry Standard Stack Flow Rate	DSCFM	46,703	45,355	45,355	45,804
Air Flow and Moisture Taken From Test Run =>		2-O-M316-1	2-O-M8-2	2-O-M8-2	

Unit 2 FF Outlet	
Total Hydrocarbons (as Ethane)	
Formula Weight	Fwt
Concentration, ppm (wet)	ppmvw
Concentration, ppm (dry)	ppmvd
Concentration, ppm@7%O₂	ppm@7%O ₂
Concentration, ppm@12%CO₂	ppm@12%CO ₂
Emission Rate, lb/hr	lb/hr

CONCENTRATION AND EMISSION RATE DATA SUMMARY

Client Name	Covanta Energy Group, Inc.
Plant Name	Huntington Resource Recovery
Sampling Location	Unit 2 SDA Inlet
Sampling Location	Unit 2 FF Outlet
Operator	10843
Project #	CMW

USE IN AVERAGE OF RUN SET? 1 or 0 =>	1	1	1	
CEM Run Number	7	8	9	
Run Date		08/29/12	08/29/12	08/29/12
Run Start Time	hh:mm	1147	1356	1431
Run Stop Time	hh:mm	1211	1420	1455
Moisture Content	% H ₂ O	16.3	16.1	16.1
Dry Mole Fraction	Mfd	0.837	0.839	0.839
Carbon Dioxide Percentage	% CO ₂	8.386	8.332	8.322
Oxygen Percentage	% O ₂	11.124	11.379	11.334
Dry Standard Stack Flow Rate	DSCFM	47,325	46,356	46,356
Air Flow and Moisture Taken From Test Run =>	2-O-M316-2	2-O-M8-3	2-O-M8-2	

<i>Unit 2 FF Outlet</i>	
Total Hydrocarbons (as Ethane)	
Formula Weight	Fwt
Concentration, ppm (wet)	ppmw
Concentration, ppm (dry)	ppmvd
Concentration, ppm@7%O ₂	ppm@7%O ₂
Concentration, ppm@12%CO ₂	ppm@12%CO ₂
Emission Rate, lb/hr	lb/hr

CONCENTRATION AND EMISSION RATE DATA SUMMARY

Client Name	Covanta Energy Group, Inc.
Plant Name	Huntington Resource Recovery
Sampling Location	Unit 2 SDA Inlet
Sampling Location	Unit 2 FF Outlet
Operator	10843
Project #	CMW

Repetition Number	1	2	3

Unit 2 FF Outlet	
Total Hydrocarbons (as Ethane)	
Concentration, ppm (wet)	ppmvw
	0.297
Concentration, ppm (dry)	ppmvd
	0.249
Concentration, ppm@7%O₂	ppm@7%O ₂
	0.356
Concentration, ppm@12%CO₂	ppm@12%CO ₂
	0.354
Emission Rate, lb/hr	lb/hr
	0.0565
	0.303
	0.329
	0.276
	0.398
	0.378
	0.397
	0.376
	0.0542
	0.0604
	0.0571
	0.310

APPENDIX A.18
Test Results

Unit 3 SDA Inlet
Hydrogen Chloride

ISOKINETIC SAMPLING TRAIN RESULTS - METHOD:

MM26

Client Name	Covanta Energy Group, Inc.	Operator	CAN
Plant Name	Huntington Resource Recovery Facility	Project #	10843
Sampling Location	Unit 3 SDA Inlet	Standard Temperature, °F	68

USE IN AVERAGE OF RUN SET? 1 or 0 =>	1	1	1		SET AVERAGE
Run Number	3-I-MM26-1	3-I-MM26-2	3-I-MM26-3		
Run Date	09/07/12	09/07/12	09/07/12		
Run Start Time	hh:mm	844	1112	1403	
Run Stop Time	hh:mm	955	1221	1513	

Sampling Parameters

Meter Calibration Factor	Y	1.0029	1.0029	1.0029	
Y_{OA} Calculated by Test Run	Y _{OA}	1.0309	1.0424	1.0293	
Y_{OA} PASS/FAIL by Test Run	Check	PASS	PASS	PASS	PASS
Pitot Tube Coefficient	C _p	0.84	0.84	0.84	
Stack/Duct Static Pressure	in H ₂ O	-2.80	-2.80	-2.80	-2.80
Barometric Pressure	in Hg	29.8	29.8	29.8	29.8
Carbon Dioxide Percentage	% CO ₂	9.9	10.2	10.3	10.1
Oxygen Percentage	% O ₂	9.8	9.4	9.4	9.5
Carbon Monoxide Percentage	% CO	0.0	0.0	0.0	0.0
Nitrogen Percentage	% N ₂	80.3	80.4	80.3	80.3
Total Water Volume Collected	mL	165.3	158.1	150.1	157.8
Sample Volume	ft ³	38.980	38.780	39.365	39.042
Average Meter Temperature	°F	81	88	91	87
Average Delta H	in H ₂ O	1.40	1.40	1.40	1.40
Total Sampling Time	min	60	60	60	60

Air Flow Parameters

Volume of Water vapor @ STP	SCF	7.781	7.442	7.065		7.429
Volume Metered @ STP	DSCF	38.084	37.405	37.769		37.753
Absolute Stack/Duct Pressure	in Hg	29.6	29.6	29.6		29.6
Absolute Meter Pressure	in Hg	29.9	29.9	29.9		29.9
Calculated Stack Moisture	% H ₂ O	17.0	16.6	15.8		16.4

Concentration and Emission Rate Data Summary

Hydrogen Chloride	mg	2501	905	980	
Molecular Weight	MW	36.46	36.46	36.46	
Concentration, ppm	ppm	1530	564	605	899
Concentration @ 12% CO₂	ppm@12%	1855	663	704	1074
Concentration @ 7% O₂	ppm@7%	1916	681	731	1109

APPENDIX A.19
Test Results

Unit 3 SDA Inlet
Mercury

ISOKINETIC SAMPLING TRAIN RESULTS - METHOD

M29

Client Name	Covanta Energy Group, Inc.	Operator	CAN
Plant Name	Huntington Resource Recovery Facility	Project #	10843
Sampling Location	Unit 3 SDA Inlet	Standard Temperature, °F	68

USE IN AVERAGE OF RUN SET? 1 or 0 =>	1	1	1	SET AVERAGE
Run Number		3-I-M29-1	3-I-M29-2	
Run Date		09/07/12	09/07/12	
Run Start Time	hh:mm	813	1041	
Run Stop Time	hh:mm	1024	1314	1542

Sampling Parameters

Meter Calibration Factor	Y	1.0108	1.0108	1.0108	
Y _{OA} Calculated by Test Run	Y _{OA}	0.9801	0.9892	0.9887	
Y _{OA} PASS/FAIL by Test Run	Check	PASS	PASS	PASS	PASS
Pitot Tube Coefficient	C _p	0.84	0.84	0.84	
Stack/Duct Static Pressure	in H ₂ O	-2.80	-2.80	-2.80	-2.80
Stack Cross-Sectional Area	ft ²	23.758	23.758	23.758	23.758
Barometric Pressure	in Hg	29.8	29.8	29.8	29.8
Actual Nozzle Diameter	in	0.234	0.236	0.234	
Carbon Dioxide Percentage	% CO ₂	9.9	10.2	10.3	10.1
Oxygen Percentage	% O ₂	9.8	9.4	9.4	9.5
Carbon Monoxide Percentage	% CO	0.0	0.0	0.0	0.0
Nitrogen Percentage	% N ₂	80.3	80.4	80.3	80.3
Total Water Volume Collected	mL	270.3	256.0	249.8	258.7
Sample Volume	ft ³	64.025	62.145	61.810	62.660
Average Meter Temperature	°F	83	92	95	90
Average Stack Temperature	°F	430	433	439	434
Average Delta H	in H ₂ O	0.80	0.76	0.75	0.77
Total Sampling Time	min	120	120	120	120

Air Flow Parameters

Volume of Water vapor @ STP	SCF	12.723	12.050	11.758	12.177
Volume Metered @ STP	DSCF	62.727	59.963	59.332	60.674
Absolute Stack/Duct Pressure	in Hg	29.6	29.6	29.6	29.6
Absolute Meter Pressure	in Hg	29.9	29.9	29.9	29.9
Calculated Stack Moisture	% H ₂ O	16.9	16.7	16.5	16.7
Dry Mole Fraction	decimal	0.831	0.833	0.835	0.833
Avg Differential Pressure (Delta P)	in H ₂ O	0.636	0.583	0.592	0.604
Dry Gas Molecular Weight	lb/lb-mole	29.98	30.01	30.02	30.00
Wet Stack Gas Molecular Weight	lb/lb-mole	27.96	28.00	28.04	28.00
Average Stack Gas Velocity	ft/sec	59.41	56.95	57.55	57.97
Percent of Isokinetic Rate	% ISO	100.7	98.9	99.0	99.5

Air Flow Rate Results

Actual Stack Flow/Minute	ACFM	84,691	81,184	82,031	82,635
Dry Standard Stack Flow/Minute	DSCFM	41,320	39,514	39,757	40,197

Concentration and Emission Rate Data Summary

Mercury (Hg)	ug	< 52.132	< 57.620	< 164.670	< 91.474
Concentration ug/DSCM	ug/DSCM	< 29.3	< 33.9	< 98.0	< 53.8
Concentration ug @ 12% CO ₂	ug@12%	< 35.6	< 39.9	< 114	< 63.2
Concentration ug @ 7% O ₂	ug@7%	< 36.7	< 41.0	< 118	< 65.4
Emission Rate, lb/hr	lb/hr	< 4.54E-03	< 5.02E-03	< 1.46E-02	< 8.05E-03

APPENDIX A.20
Test Results

Unit 3 FF Outlet
Ammonia, Hydrogen Chloride, and Hydrogen Fluoride

ISOKINETIC SAMPLING TRAIN RESULTS - METHOD:

M26A

Client Name	Covanta Energy Group, Inc.	Operator	SGD
Plant Name	Huntington Resource Recovery Facility	Project #	10843
Sampling Location	Unit 3 FF Outlet	Standard Temperature, °F	68

USE IN AVERAGE OF RUN SET? 1 or 0 =>	1	1	1	SET AVERAGE
Run Number	3-O-M26A-1	3-O-M26A-2	3-O-M26A-3	
Run Date	09/07/12	09/07/12	09/07/12	
Run Start Time	hh:mm	844	1112	
Run Stop Time	hh:mm	955	1221	1513

Sampling Parameters

Meter Calibration Factor	Y	1.0192	1.0192	1.0192	
Y _{QA} Calculated by Test Run	Y _{QA}	1.0243	1.0271	1.0152	
Y _{QA} PASS/FAIL by Test Run	Check	PASS	PASS	PASS	PASS
Pitot Tube Coefficient	C _p	0.84	0.84	0.84	
Stack/Duct Static Pressure	in H ₂ O	-15.50	-15.50	-15.50	-15.50
Stack Cross-Sectional Area	ft ²	21.648	21.648	21.648	21.648
Barometric Pressure	in Hg	29.8	29.8	29.8	29.8
Actual Nozzle Diameter	in	0.218	0.218	0.218	
Carbon Dioxide Percentage	% CO ₂	9.0	9.0	8.9	9.0
Oxygen Percentage	% O ₂	10.8	10.6	10.8	10.7
Carbon Monoxide Percentage	% CO	0.0	0.0	0.0	0.0
Nitrogen Percentage	% N ₂	80.2	80.4	80.3	80.3
Total Water Volume Collected	mL	168.9	168.4	165.0	167.4
Sample Volume	ft ³	34.491	34.405	34.825	34.574
Average Meter Temperature	°F	83	88	89	87
Average Stack Temperature	°F	286	285	285	286
Average Delta H	in H ₂ O	1.06	1.05	1.05	1.05
Total Sampling Time	min	60	60	60	60

Air Flow Parameters

Volume of Water vapor @ STP	SCF	7.950	7.927	7.767	7.881
Volume Metered @ STP	DSCF	34.132	33.719	34.072	33.974
Absolute Stack/Duct Pressure	in Hg	28.7	28.7	28.7	28.7
Absolute Meter Pressure	in Hg	29.9	29.9	29.9	29.9
Calculated Stack Moisture	% H ₂ O	18.9	19.0	18.6	18.8
Saturated Stack Moisture	% H ₂ O	100.0	100.0	100.0	100.0
Reported Stack Moisture Content	% H ₂ O	18.9	19.0	18.6	18.8
Dry Mole Fraction	decimal	0.811	0.810	0.814	0.812
Avg Differential Pressure (Delta P)	in H ₂ O	0.932	0.924	0.922	0.926
Dry Gas Molecular Weight	lb/lb-mole	29.87	29.86	29.86	29.86
Wet Stack Gas Molecular Weight	lb/lb-mole	27.63	27.61	27.66	27.63
Average Stack Gas Velocity	ft/sec	67.30	66.98	66.86	67.05
Percent of Isokinetic Rate	% ISO	98.9	98.2	98.8	98.7

Air Flow Rate Results

Actual Stack Flow/Minute	ACFM	87,417	87,000	86,845	87,087
Dry Standard Stack Flow/Minute	DSCFM	48,046	47,805	48,008	47,953

Concentration and Emission Rate Data Summary					
Hydrogen Chloride	mg	20.1	5.20	3.66	
Molecular Weight	MW	36.46	36.46	36.46	
Concentration, ppm	ppm	13.7	3.59	2.50	6.61
Concentration @ 12% CO ₂	ppm@12%	18.3	4.79	3.37	8.82
Concentration @ 7% O ₂	ppm@7%	18.9	4.85	3.44	9.06
Emission Rate, lb/hr	lb/hr	3.74	0.975	0.682	1.80
Ammonia	mg	1.88	2.07	1.73	
Molecular Weight	MW	17.01	17.01	17.01	
Concentration, ppm	ppm	2.75	3.07	2.54	2.78
Concentration @ 12% CO ₂	ppm@12%	3.67	4.09	3.42	3.72
Concentration @ 7% O ₂	ppm@7%	3.79	4.14	3.49	3.80
Emission Rate, lb/hr	lb/hr	0.350	0.388	0.322	0.354
Hydrogen Fluoride as HF	mg	< 0.094	< 0.097	< 0.096	
Molecular Weight	MW	20.01	20.01	20.01	
Concentration, ppm	ppm	< 0.117	< 0.122	< 0.120	< 0.120
Concentration @ 12% CO ₂	ppm@12%	< 0.156	< 0.163	< 0.161	< 0.160
Concentration @ 7% O ₂	ppm@7%	< 0.161	< 0.165	< 0.165	< 0.163
Emission Rate, lb/hr	lb/hr	< 0.0175	< 0.0182	< 0.0179	< 0.0179

Removal Efficiency Summary For:

HCl

Unit #	Repetition Number	ppm @ 7 % O2		Removal Efficiency, %
		Inlet Result	Outlet Result	
3	1	1916	18.9	99.0%
	2	681	4.85	99.3%
	3	731	3.44	99.5%
AVERAGE =>				99.3%

APPENDIX A.21
Test Results

Unit 3 FF Outlet
Formaldehyde

ISOKINETIC SAMPLING TRAIN RESULTS - METHOD:

M316

Client Name	Covanta Energy Group, Inc.	Operator	SGD
Plant Name	Huntington Resource Recovery Facility	Project #	10843
Sampling Location	Unit 3 FF Outlet	Standard Temperature, °F	68

USE IN AVERAGE OF RUN SET? 1 or 0 =>	1	1	1		SET AVERAGE
Run Number		3-O-M316-1	3-O-M316-2	3-O-M316-3	
Run Date		08/30/12	08/30/12	08/30/12	
Run Start Time	hh:mm	930	1220	1521	
Run Stop Time	hh:mm	1033	1324	1625	

Sampling Parameters

Meter Calibration Factor	Y	0.9977	0.9977	0.9977	
Y_{QA} Calculated by Test Run	Y _{QA}	1.0078	0.9998	0.9883	
Y_{QA} PASS/FAIL by Test Run	Check	PASS	PASS	PASS	PASS
Pitot Tube Coefficient	C _b	0.84	0.84	0.84	
Stack/Duct Static Pressure	in H ₂ O	-15.00	-15.50	-15.30	-15.27
Stack Cross-Sectional Area	ft ²	21.648	21.648	21.648	21.648
Barometric Pressure	in Hg	29.9	29.9	29.9	29.9
Actual Nozzle Diameter	in	0.216	0.216	0.216	
Carbon Dioxide Percentage	% CO ₂	8.7	8.8	8.9	8.8
Oxygen Percentage	% O ₂	11.0	11.0	10.9	11.0
Carbon Monoxide Percentage	% CO	0.0	0.0	0.0	0.0
Nitrogen Percentage	% N ₂	80.3	80.2	80.2	80.2
Total Water Volume Collected	mL	157.5	137.0	148.0	147.5
Sample Volume	ft ³	34.936	34.721	35.362	35.006
Average Meter Temperature	°F	75	77	85	79
Average Stack Temperature	°F	286	286	287	286
Average Delta H	in H ₂ O	1.00	0.97	0.97	0.98
Total Sampling Time	min	60	60	60	60

Air Flow Parameters

Volume of Water vapor @ STP	SCF	7.414	6.449	6.966	6.943
Volume Metered @ STP	DSCF	34.469	34.131	34.221	34.274
Absolute Stack/Duct Pressure	in Hg	28.8	28.8	28.8	28.8
Absolute Meter Pressure	in Hg	30.0	30.0	30.0	30.0
Calculated Stack Moisture	% H ₂ O	17.7	15.9	16.9	16.8
Dry Mole Fraction	decimal	0.823	0.841	0.831	0.832
Avg Differential Pressure (Delta P)	in H ₂ O	0.975	0.948	0.944	0.956
Dry Gas Molecular Weight	lb/lb-mole	29.83	29.85	29.86	29.85
Wet Stack Gas Molecular Weight	lb/lb-mole	27.74	27.97	27.85	27.85
Average Stack Gas Velocity	ft/sec	68.53	67.33	67.34	67.73
Percent of Isokinetic Rate	% ISO	98.0	96.7	98.2	97.6

Air Flow Rate Results

Actual Stack Flow/Minute	ACFM	89,009	87,460	87,469	87,979
Dry Standard Stack Flow/Minute	DSCFM	49,904	50,049	49,433	49,796

Concentration and Emission Rate Data Summary

Formaldehyde	ug	21.5 <	11.1	30.4	
Molecular Weight	MW	30.03	30.03	30.03	
Concentration ug/DSCM	ug/DSCM	22.0 <	11.5	31.4	< 21.6
Concentration @ 12% CO₂	ug@12%	30.4 <	15.7	42.3	< 29.4
Concentration @ 7% O₂	ug@7%	30.9 <	16.1	43.6	< 30.2
Emission Rate, lb/hr	lb/hr	4.12E-03 <	2.15E-03	5.81E-03	< 4.03E-03

APPENDIX A.22
Test Results

Unit 3 FF Outlet
Particulate and Metals

ISOKINETIC SAMPLING TRAIN RESULTS - METHOD

M29

Client Name	Covanta Energy Group, Inc.	Operator	JMA
Plant Name	Huntington Resource Recovery Facility	Project #	10843
Sampling Location	Unit 3 FF Outlet	Standard Temperature, °F	68

USE IN AVERAGE OF RUN SET? 1 or 0 =>	1	1	1		SET AVERAGE
Run Number		3-O-M29-1	3-O-M29-2	3-O-M29-3	
Run Date		09/07/12	09/07/12	09/07/12	
Run Start Time	hh:mm	813	1041	1331	
Run Stop Time	hh:mm	1024	1314	1542	

Sampling Parameters

Meter Calibration Factor	Y	0.9977	0.9977	0.9977	
Y _{OA} Calculated by Test Run	Y _{OA}	0.9824	0.9776	0.9779	
Y _{OA} PASS/FAIL by Test Run	Check	PASS	PASS	PASS	PASS
Pitot Tube Coefficient	C _p	0.84	0.84	0.84	
Stack/Duct Static Pressure	in H ₂ O	-15.50	-15.50	-15.50	-15.50
Stack Cross-Sectional Area	ft ²	21.648	21.648	21.648	21.648
Barometric Pressure	in Hg	29.8	29.8	29.8	29.8
Actual Nozzle Diameter	in	0.220	0.218	0.220	
Carbon Dioxide Percentage	% CO ₂	9.0	9.0	8.9	9.0
Oxygen Percentage	% O ₂	10.8	10.6	10.8	10.7
Carbon Monoxide Percentage	% CO	0.0	0.0	0.0	0.0
Nitrogen Percentage	% N ₂	80.2	80.4	80.3	80.3
Total Water Volume Collected	mL	335.8	328.3	356.3	340.1
Sample Volume	ft ³	72.163	69.183	74.454	71.933
Average Meter Temperature	°F	85	87	88	87
Average Stack Temperature	°F	285	287	287	287
Average Delta H	in H ₂ O	0.99	0.90	1.04	0.98
Total Sampling Time	min	120	120	120	120

Air Flow Parameters

Volume of Water vapor @ STP	SCF	15.806	15.453	16.771	16.010
Volume Metered @ STP	DSCF	69.619	66.465	71.401	69.162
Absolute Stack/Duct Pressure	in Hg	28.7	28.7	28.7	28.7
Absolute Meter Pressure	in Hg	29.9	29.9	29.9	29.9
Calculated Stack Moisture	% H ₂ O	18.5	18.9	19.0	18.8
Saturated Stack Moisture	% H ₂ O	100.0	100.0	100.0	100.0
Reported Stack Moisture Content	% H ₂ O	18.5	18.9	19.0	18.8
Dry Mole Fraction	decimal	0.815	0.811	0.810	0.812
Avg Differential Pressure (Delta P)	in H ₂ O	0.901	0.846	0.944	0.897
Dry Gas Molecular Weight	lb/lb-mole	29.87	29.86	29.86	29.86
Wet Stack Gas Molecular Weight	lb/lb-mole	27.68	27.63	27.60	27.63
Average Stack Gas Velocity	ft/sec	66.04	64.19	67.81	66.01
Percent of Isokinetic Rate	% ISO	100.3	101.1	101.1	100.8

Air Flow Rate Results

Actual Stack Flow/Minute	ACFM	85,784	83,371	88,076	85,743
Dry Standard Stack Flow/Minute	DSCFM	47,462	45,774	48,261	47,166

Concentration and Emission Rate Data Summary						
Filterable Particulate	mg	0.3	0.5	1.6		0.8
Concentration, Gr/DSCF	gr/DSCF	6.65E-05	1.16E-04	3.46E-04		1.76E-04
Concentration @ 12% CO ₂	Gr@12%	8.87E-05	1.55E-04	4.66E-04		2.37E-04
Concentration @ 7% O ₂	Gr@7%	9.15E-05	1.57E-04	4.76E-04		2.41E-04
Concentration mg/DSCM	mg/DSCM	0.152	0.266	0.791		0.403
Concentration mg @ 7% O ₂	mg@7%	0.209	0.358	1.09		0.552
Emission Rate, lb/hr	lb/hr	0.0271	0.0455	0.143		0.0719
Arsenic (As)	ug	0.237	0.260	< 0.200	<	0.232
Concentration ug/DSCM	ug/DSCM	0.120	0.138	< 0.099	<	0.119
Concentration ug @ 12% CO ₂	ug@12%	0.160	0.184	< 0.133	<	0.159
Concentration ug @ 7% O ₂	ug@7%	0.165	0.186	< 0.136	<	0.163
Emission Rate, lb/hr	lb/hr	2.14E-05	2.37E-05	< 1.79E-05	<	2.10E-05
Beryllium (Be)	ug	< 0.050	< 0.050	< 0.050	<	0.050
Concentration ug/DSCM	ug/DSCM	< 0.0254	< 0.0266	< 0.0247	<	0.0256
Concentration ug @ 12% CO ₂	ug@12%	< 0.0338	< 0.0354	< 0.0333	<	0.0342
Concentration ug @ 7% O ₂	ug@7%	< 0.0349	< 0.0358	< 0.0340	<	0.0349
Emission Rate, lb/hr	lb/hr	< 4.51E-06	< 4.55E-06	< 4.47E-06	<	4.51E-06
Cadmium (Cd)	ug	0.343	0.208	0.407		0.319
Concentration ug/DSCM	ug/DSCM	0.174	0.111	0.201		0.162
Concentration ug @ 12% CO ₂	ug@12%	0.232	0.147	0.271		0.217
Concentration ug @ 7% O ₂	ug@7%	0.239	0.149	0.277		0.222
Emission Rate, lb/hr	lb/hr	3.09E-05	1.89E-05	3.64E-05		2.88E-05
Total Chromium (Cr)	ug	3.330	2.845	2.680		2.952
Concentration ug/DSCM	ug/DSCM	1.69	1.51	1.33		1.51
Concentration ug @ 12% CO ₂	ug@12%	2.25	2.02	1.79		2.02
Concentration ug @ 7% O ₂	ug@7%	2.32	2.04	1.82		2.06
Emission Rate, lb/hr	lb/hr	3.00E-04	2.59E-04	2.40E-04		2.66E-04
Lead (Pb)	ug	11.800	2.890	5.720		6.803
Concentration ug/DSCM	ug/DSCM	5.98	1.54	2.83		3.45
Concentration ug @ 12% CO ₂	ug@12%	7.98	2.05	3.81		4.61
Concentration ug @ 7% O ₂	ug@7%	8.24	2.07	3.89		4.73
Emission Rate, lb/hr	lb/hr	1.06E-03	2.63E-04	5.11E-04		6.13E-04
Manganese (Mn)	ug	2.980	2.895	4.740		3.538
Concentration ug/DSCM	ug/DSCM	1.51	1.54	2.34		1.80
Concentration ug @ 12% CO ₂	ug@12%	2.02	2.05	3.16		2.41
Concentration ug @ 7% O ₂	ug@7%	2.08	2.08	3.23		2.46
Emission Rate, lb/hr	lb/hr	2.69E-04	2.64E-04	4.24E-04		3.19E-04
Mercury (Hg)	ug	< 1.860	< 1.800	< 1.879	<	1.846
Concentration ug/DSCM	ug/DSCM	< 0.943	< 0.956	< 0.929	<	0.943
Concentration ug @ 12% CO ₂	ug@12%	< 1.26	< 1.28	< 1.25	<	1.26
Concentration ug @ 7% O ₂	ug@7%	< 1.30	< 1.29	< 1.28	<	1.29
Emission Rate, lb/hr	lb/hr	< 1.68E-04	< 1.64E-04	< 1.68E-04	<	1.67E-04

Nickel (Ni)	ug	5.440	4.090	9.700		6.410
Concentration ug/DSCM	ug/DSCM	2.76	2.17	4.80		3.24
Concentration ug @ 12% CO2	ug@12%	3.68	2.90	6.47		4.35
Concentration ug @ 7% O ₂	ug@7%	3.80	2.93	6.60		4.44
Emission Rate, lb/hr	lb/hr	4.91E-04	3.73E-04	8.67E-04		5.77E-04

Vanadium (V)	ug	< 0.200	< 0.200	< 0.200		< 0.200
Concentration ug/DSCM	ug/DSCM	< 0.101	< 0.106	< 0.099		< 0.102
Concentration ug @ 12% CO2	ug@12%	< 0.135	< 0.142	< 0.133		< 0.137
Concentration ug @ 7% O ₂	ug@7%	< 0.140	< 0.143	< 0.136		< 0.140
Emission Rate, lb/hr	lb/hr	< 1.80E-05	< 1.82E-05	< 1.79E-05		< 1.80E-05

Zinc (Zn)	ug	32.300	43.500	35.000		36.933
Concentration ug/DSCM	ug/DSCM	16.4	23.1	17.3		18.9
Concentration ug @ 12% CO2	ug@12%	21.8	30.8	23.3		25.3
Concentration ug @ 7% O ₂	ug@7%	22.5	31.2	23.8		25.9
Emission Rate, lb/hr	lb/hr	2.91E-03	3.96E-03	3.13E-03		3.33E-03

Removal Efficiency Summary For: Mercury

Unit #	Repetition Number	ug/DSCM @ 7% O2		Removal Efficiency, %
		Inlet Result	Stack Result	
3	1	< 36.7	< 1.30	96.5%
	2	< 41.0	< 1.29	96.9%
	3	< 118	< 1.28	98.9%
AVERAGE =>				97.4%

APPENDIX A.23
Test Results

Unit 3 FF Outlet
PM10

ISOKINETIC SAMPLING TRAIN RESULTS - METHOD:

M201A

Client Name	Covanta Energy Group, Inc.	Operator	WES
Plant Name	Huntington Resource Recovery Facility	Project #	10843
Sampling Location	Unit 3 FF Outlet	Standard Temperature, °F	68

USE IN AVERAGE OF RUN SET? 1 or 0 =>	1	1	1		SET AVERAGE
Run Number		3-O-M201A-1	3-O-M201A-2	3-O-M201A-3	
Run Date		08/29/12	08/29/12	08/29/12	
Run Start Time	hh:mm	800	1043	1340	
Run Stop Time	hh:mm	957	1250	1549	

Sampling Parameters

Meter Calibration Factor	Y	0.9977	0.9977	0.9977	
Y_{QA} Calculated by Test Run	Y _{QA}	1.0161	1.0128	0.9993	
Y_{QA} PASS/FAIL by Test Run	Check	PASS	PASS	PASS	PASS
Pitot Tube Coefficient	C _p	0.7382	0.7617	0.7382	
Stack/Duct Static Pressure	in H ₂ O	-14.50	-14.50	-14.50	-14.50
Stack Cross-Sectional Area	ft ²	21.65	21.65	21.65	21.65
Barometric Pressure	in Hg	29.8	29.8	29.8	29.8
Actual Nozzle Diameter	in	0.156	0.165	0.168	
Carbon Dioxide Percentage	% CO ₂	8.3	8.1	8.2	8.2
Oxygen Percentage	% O ₂	11.4	11.6	11.4	11.5
Carbon Monoxide Percentage	% CO	0.0	0.0	0.0	0.0
Nitrogen Percentage	% N ₂	80.3	80.3	80.4	80.3
Total Water Volume Collected	mL	149.0	159.0	156.5	154.8
Sample Volume	ft ³	37.270	40.400	42.724	40.131
Average Meter Temperature	°F	73	75	76	75
Average Stack Temperature	°F	285	288	287	286
Average Delta H	in H ₂ O	0.33	0.33	0.34	0.33
Total Sampling Time	min	111.75	120.50	123.75	118.67

Air Flow Parameters

Volume of Water vapor @ STP	SCF	7.013	7.484	7.366	7.288
Volume Metered @ STP	DSCF	36.700	39.625	41.824	39.383
Absolute Stack/Duct Pressure	in Hg	28.7	28.7	28.7	28.7
Absolute Meter Pressure	in Hg	29.8	29.8	29.8	29.8
Calculated Stack Moisture	% H ₂ O	16.0	15.9	15.0	15.6
Reported Stack Moisture Content	% H ₂ O	16.0	15.9	15.0	15.6
Dry Mole Fraction	decimal	0.840	0.841	0.850	0.844
Avg Differential Pressure (Delta P)	in H ₂ O	1.251	1.179	1.335	1.255
Dry Gas Molecular Weight	lb/lb-mole	29.78	29.76	29.77	29.77
Wet Stack Gas Molecular Weight	lb/lb-mole	27.89	27.89	28.01	27.93
Average Stack Gas Velocity	ft/sec	68.03	68.28	70.26	68.86
Percent of Isokinetic Rate	% ISO	106.0	94.8	90.3	97.0

Air Flow Rate Results

Actual Stack Flow/Minute	ACFM	88,376	88,700	91,266	89,447
Dry Standard Stack Flow/Minute	DSCFM	50,529	50,599	52,663	51,263
Dry Standard Flow/Minute @ 7% O₂	DSCFM7	34,534	33,854	35,992	34,794

Cyclone Calculations					
Sample Flow Rate at Standard Conds.	Q _{sST}	0.328	0.329	0.338	0.332
Cyclone Flow at Actual Conditons	Q _s	0.574	0.576	0.586	0.579
Flue Gas Viscosity, micropoise	μ	216.2	217.2	217.8	217.1
Reynolds Number	N _{re}	2470	2458	2502	2477
PM 10 Particle Cut Size	D ₅₀	10.32	10.33	10.23	10.29
Cunningham Correction Factor	C	1.089	1.090	1.090	1.089

QA/QC Calculations					
%ISO Results, 80%<I<120%	ISO %	YES	YES	YES	YES
PM10 Cut Size, 9um<D ₅₀ <11um	PM10	YES	YES	YES	YES
% of Catch <10um	%	3.9	53.8	23.8	27.2

Concentration and Emission Rate Data Summary					
Particulate Fraction <10 microns	mg	0.7	0.7	0.5	0.6
Concentration, Gr/DSCF	gr/DSCF	2.94E-04	2.73E-04	1.84E-04	2.50E-04
Concentration, Gr/DSCF @ 7% O ₂	Gr@7%	4.31E-04	4.07E-04	2.70E-04	3.69E-04
Concentration, mg/DSCM	mg/DSCM	0.673	0.624	0.422	0.573
Concentration, mg/DSCM @ 7% O ₂	mg@7%	0.985	0.932	0.618	0.845
Emission Rate, lb/hr	lb/hr	0.127	0.118	0.0833	0.110

Particulate Fraction >10 microns	mg	17.4	0.6	1.6	6.5
Concentration, Gr/DSCF	gr/DSCF	7.32E-03	2.34E-04	5.90E-04	2.71E-03
Concentration, Gr/DSCF @ 7% O ₂	Gr@7%	1.07E-02	3.49E-04	8.64E-04	3.97E-03
Concentration, mg/DSCM	mg/DSCM	16.7	0.535	1.35	6.21
Concentration, mg/DSCM @ 7% O ₂	mg@7%	24.5	0.799	1.98	9.09
Emission Rate, lb/hr	lb/hr	3.17	0.101	0.266	1.18

Total Filterable Particulate	mg	18.1	1.3	2.1	7.2
Concentration, Gr/DSCF	gr/DSCF	7.61E-03	5.06E-04	7.75E-04	2.96E-03
Concentration, Gr/DSCF @ 7% O ₂	Gr@7%	1.11E-02	7.57E-04	1.13E-03	4.34E-03
Concentration, mg/DSCM	mg/DSCM	17.4	1.16	1.77	6.78
Concentration, mg/DSCM @ 7% O ₂	mg@7%	25.5	1.73	2.59	9.94
Emission Rate, lb/hr	lb/hr	3.30	0.220	0.350	1.29

APPENDIX A.24
Test Results

Unit 3 FF Outlet
Sulfuric Acid Mist

ISOKINETIC SAMPLING TRAIN RESULTS - METHOD:

M8

Client Name	Covanta Energy Group, Inc.	Operator	SGD
Plant Name	Huntington Resource Recovery Facility	Project #	10843
Sampling Location	Unit 3 FF Outlet	Standard Temperature, °F	68

USE IN AVERAGE OF RUN SET? 1 or 0 =>	1	1	1		SET AVERAGE
Run Number	3-O-M8-1	3-O-M8-2	3-O-M8-3		
Run Date	08/30/12	08/30/12	08/30/12		
Run Start Time	hh:mm	810	1054	1350	
Run Stop Time	hh:mm	914	1158	1454	

Sampling Parameters

Meter Calibration Factor	Y	0.9977	0.9977	0.9977	
Y_{QA} Calculated by Test Run	Y _{OA}	1.0075	1.0054	1.0145	
Y_{QA} PASS/FAIL by Test Run	Check	PASS	PASS	PASS	PASS
Pitot Tube Coefficient	C _b	0.84	0.84	0.84	
Stack/Duct Static Pressure	in H ₂ O	-15.00	-15.40	-15.60	-15.33
Stack Cross-Sectional Area	ft ²	21.648	21.648	21.648	21.648
Barometric Pressure	in Hg	29.9	29.9	29.9	29.9
Actual Nozzle Diameter	in	0.218	0.218	0.218	
Carbon Dioxide Percentage	% CO ₂	8.2	8.4	8.4	8.3
Oxygen Percentage	% O ₂	11.5	11.4	11.4	11.4
Carbon Monoxide Percentage	% CO	0.0	0.0	0.0	0.0
Nitrogen Percentage	% N ₂	80.3	80.2	80.2	80.2
Total Water Volume Collected	mL	123.5	154.0	150.5	142.7
Sample Volume	ft ³	34.056	35.213	35.800	35.023
Average Meter Temperature	°F	70	76	82	76
Average Stack Temperature	°F	287	286	287	286
Average Delta H	in H ₂ O	0.96	1.01	1.05	1.01
Total Sampling Time	min	60	60	60	60

Air Flow Parameters

Volume of Water vapor @ STP	SCF	5.813	7.249	7.084	6.715
Volume Metered @ STP	DSCF	33.885	34.654	34.874	34.471
Absolute Stack/Duct Pressure	in Hg	28.8	28.8	28.8	28.8
Absolute Meter Pressure	in Hg	30.0	30.0	30.0	30.0
Calculated Stack Moisture	% H ₂ O	14.6	17.3	16.9	16.3
Dry Mole Fraction	decimal	0.854	0.827	0.831	0.837
Avg Differential Pressure (Delta P)	in H ₂ O	0.899	0.949	0.989	0.945
Dry Gas Molecular Weight	lb/lb-mole	29.77	29.80	29.80	29.79
Wet Stack Gas Molecular Weight	lb/lb-mole	28.05	27.76	27.81	27.87
Average Stack Gas Velocity	ft/sec	65.46	67.59	69.01	67.36
Percent of Isokinetic Rate	% ISO	95.6	97.6	95.9	96.4

Air Flow Rate Results

Actual Stack Flow/Minute	ACFM	85,027	87,795	89,637	87,486
Dry Standard Stack Flow/Minute	DSCFM	49,382	49,427	50,621	49,810

Concentration and Emission Rate Data Summary

Sulfuric Acid Mist	mg	< 0.095	< 0.105	< 0.103	
Molecular Weight	MW	98.08	98.08	98.08	
Concentration, ppm	ppm	< 0.0243	< 0.0262	< 0.0256	< 0.0254
Concentration @ 12% CO₂	ppm@12%	< 0.0355	< 0.0375	< 0.0365	< 0.0365
Concentration @ 7% O₂	ppm@7%	< 0.0359	< 0.0384	< 0.0374	< 0.0372
Emission Rate, lb/hr	lb/hr	< 0.0183	< 0.0198	< 0.0198	< 0.0193

APPENDIX A.25
Test Results

Unit 3 FF Outlet
Total Hydrocarbons as Ethane

CONCENTRATION AND EMISSION RATE DATA SUMMARY

Client Name	Covanta Energy Group, Inc.
Plant Name	Huntington Resource Recovery
Sampling Location	Unit 3 FF Outlet
Operator	10843
Project #	CMW

USE IN AVERAGE OF RUN SET? 1 or 0 =>		1	1	1	
CEM Run Number		1	2	3	
Run Date		08/30/12	08/30/12	08/30/12	
Run Start Time	hh:mm	808	844	929	SET AVERAGE
Run Stop Time	hh:mm	832	908	953	
Moisture Content	% H ₂ O	14.6	14.6	17.7	15.6
Dry Mole Fraction	Mfd	0.854	0.854	0.823	0.844
Carbon Dioxide Percentage	% CO ₂	8.293	8.088	8.682	8.354
Oxygen Percentage	% O ₂	11.321	11.730	10.931	11.327
Dry Standard Stack Flow Rate	DSCFM	49,382	49,382	49,904	49,556
Air Flow and Moisture Taken From Test Run =>		3-O-M8-1	3-O-M8-1	3-O-M316-1	

Unit 3 FF Outlet					
Total Hydrocarbons (as Ethane)					
Formula Weight	Fwt	30.06	30.06	30.06	
Concentration, ppm (wet)	ppmw	0.598	0.589	0.580	0.589
Concentration, ppm (dry)	ppmvd	0.511	0.503	0.477	0.497
Concentration, ppm@7%O₂	ppm@7%O ₂	0.741	0.762	0.666	0.723
Concentration, ppm@12%CO₂	ppm@12%CO ₂	0.739	0.746	0.660	0.715
Emission Rate, lb/hr	lb/hr	0.118	0.116	0.112	0.115

CONCENTRATION AND EMISSION RATE DATA SUMMARY

Client Name	Covanta Energy Group, Inc.
Plant Name	Huntington Resource Recovery
Sampling Location	Unit 3 FF Outlet
Operator	10843
Project #	CMW

USE IN AVERAGE OF RUN SET? 1 or 0 =>	1	1	1	
CEM Run Number	4	5	6	
Run Date	08/30/12	08/30/12	08/30/12	
Run Start Time	hh:mm	1004	1053	1128
Run Stop Time	hh:mm	1028	1117	1152
Moisture Content	% H ₂ O	17.7	17.3	17.3
Dry Mole Fraction	Mfd	0.823	0.827	0.827
Carbon Dioxide Percentage	% CO ₂	8.495	8.558	8.318
Oxygen Percentage	% O ₂	11.128	11.208	11.370
Dry Standard Stack Flow Rate	DSCFM	49,904	49,427	49,427
Air Flow and Moisture Taken From Test Run =>	3-O-M316-1	3-O-M8-2	3-O-M8-2	

Unit 3 FF Outlet					
Total Hydrocarbons (as Ethane)					
Formula Weight	Fwt	30.06	30.06	30.06	
Concentration, ppm (wet)	ppmvw	0.675	0.766	0.794	0.745
Concentration, ppm (dry)	ppmvd	0.556	0.633	0.657	0.615
Concentration, ppm@7%O₂	ppm@7%O ₂	0.790	0.909	0.958	0.885
Concentration, ppm@12%CO₂	ppm@12%CO ₂	0.785	0.888	0.947	0.873
Emission Rate, lb/hr	lb/hr	0.130	0.147	0.152	0.143

CONCENTRATION AND EMISSION RATE DATA SUMMARY

Client Name	Covanta Energy Group, Inc.
Plant Name	Huntington Resource Recovery
Sampling Location	Unit 3 FF Outlet
Operator	10843
Project #	CMW

USE IN AVERAGE OF RUN SET? 1 or 0 =>	1	1	1	
CEM Run Number	7	8	9	
Run Date	08/30/12	08/30/12	08/30/12	
Run Start Time	hh:mm	1220	1255	1350
Run Stop Time	hh:mm	1244	1319	1414
Moisture Content	% H ₂ O	15.9	15.9	16.9
Dry Mole Fraction	Mfd	0.841	0.841	0.831
Carbon Dioxide Percentage	% CO ₂	8.065	8.382	8.555
Oxygen Percentage	% O ₂	11.503	11.340	11.021
Dry Standard Stack Flow Rate	DSCFM	50,049	50,049	50,621
Air Flow and Moisture Taken From Test Run =>	3-O-M316-2	3-O-M316-2	3-O-M8-3	

Unit 3 FF Outlet					
Total Hydrocarbons (as Ethane)					
Formula Weight	Fwt	30.06	30.06	30.06	
Concentration, ppm (wet)	ppmw	0.835	0.816	0.776	0.809
Concentration, ppm (dry)	ppmvd	0.702	0.686	0.645	0.678
Concentration, ppm@7%O₂	ppm@7%O ₂	1.04	0.998	0.907	0.981
Concentration, ppm@12%CO₂	ppm@12%CO ₂	1.04	0.982	0.905	0.977
Emission Rate, lb/hr	lb/hr	0.165	0.161	0.153	0.159

CONCENTRATION AND EMISSION RATE DATA SUMMARY

Client Name	Covanta Energy Group, Inc.
Plant Name	Huntington Resource Recovery
Sampling Location	Unit 3 FF Outlet
Operator	10843
Project #	CMW

Repetition Number	1	2	3
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Unit 3 FF Outlet					
Total Hydrocarbons (as Ethane)					
Concentration, ppm (wet)	ppmvw	0.589	0.745	0.809	0.714
Concentration, ppm (dry)	ppmvd	0.497	0.615	0.678	0.597
Concentration, ppm@7%O ₂	ppm@7%O ₂	0.723	0.885	0.981	0.863
Concentration, ppm@12%CO ₂	ppm@12%CO ₂	0.715	0.873	0.977	0.855
Emission Rate, lb/hr	lb/hr	0.115	0.143	0.159	0.139

APPENDIX A.26

Example Calculations

PARTICULATE AND MERCURY EXAMPLE CALCULATIONS
TEST RUN 1-O-M29-1

Volume Metered, Dry Standard Cubic Feet (STP)

$$\begin{aligned} V_{m(\text{std})} &= 17.64 * Y * V_m * (\text{Pbar} + \Delta H / 13.6) / (460 + t_m) \\ V_{m(\text{std})} &= 17.64 * 1.0065 * 76.368 * (29.6 + 1.34 / 13.6) / (460 + 84) \\ V_{m(\text{std})} &= 74.039 \end{aligned}$$

Volume of Water Collected, Dry Standard Cubic Feet (STP)

$$\begin{aligned} V_{w(\text{std})} &= 0.04707 * V_{lc} \\ V_{w(\text{std})} &= 0.04707 * 374.3 \\ V_{w(\text{std})} &= 17.618 \end{aligned}$$

Percent Moisture Content

$$\begin{aligned} \%H_2O &= 100 * V_{w(\text{std})} / (V_{w(\text{std})} + V_{m(\text{std})}) \\ \%H_2O &= 100 * 17.618 / (17.618 + 74.039) \\ \%H_2O &= 19.2 \end{aligned}$$

Mole Fraction of Flue Gas (Dry)

$$\begin{aligned} M_{fd} &= 1 - (\%H_2O / 100) \\ M_{fd} &= 1 - (19.2 / 100) \\ M_{fd} &= 0.808 \end{aligned}$$

Molecular Weight of Flue Gas (Dry)

$$\begin{aligned} M_d &= (%CO_2 * 0.44) + (%O_2 * 0.32) + ((%CO + %N_2) * 0.28) \\ M_d &= (8.5 * 0.44) + (11.1 * 0.32) + ((0 + 80.4) * 0.28) \\ M_d &= 29.80 \end{aligned}$$

Molecular Weight of Flue Gas (Wet)

$$\begin{aligned} M_s &= (M_d * M_{fd}) + (0.18 * \%H_2O) \\ M_s &= (29.8 * 0.808) + (0.18 * 19.2) \\ M_s &= 27.54 \end{aligned}$$

Flue Gas Absolute Pressure (" Hg)

$$\begin{aligned} P_s &= \text{Pbar} + (P_g / 13.6) \\ P_s &= 29.6 + (-14.5 / 13.6) \\ P_s &= 28.5 \end{aligned}$$

Flue Gas Velocity, Feet per Second, (Delta p avg is square of average square root)

$$\begin{aligned} v_s &= 85.49 * C_p * \text{SQRT} ((\Delta p_{avg} * (460 + t_s)) / (P_s * M_s)) \\ v_s &= 85.49 * 0.84 * \text{SQRT} ((1.074 * (460 + 285)) / (28.5 * 27.54)) \\ v_s &= 72.49 \end{aligned}$$

Volumetric Flowrate, Cubic Feet per Minute (STP), DSCFM

$$\begin{aligned} Q_{sd} &= 60 * Mfd * vs * A * (Tstd / (ts + 460)) * (Ps / Pstd) \\ Q_{sd} &= 60 * 0.808 * 72.49 * 21.648 * (68 / (285 + 460)) * (28.5 / 29.92) \\ Q_{sd} &= 51,390 \end{aligned}$$

Volumetric Flowrate, Cubic Feet per Minute, (Actual), ACFM

$$\begin{aligned} Q_{aw} &= 60 * vs * A \\ Q_{aw} &= 60 * 72.49 * 21.648 \\ Q_{aw} &= 94,157 \end{aligned}$$

Percent Isokinetic

$$\begin{aligned} \%I &= (Pstd / Tstd) * (100 / 60) * ((ts + 460) * vm(std)) * 144 / (Ps * vs * Mfd * Theta * Nozzle area^2) \\ \%I &= (29.92 / 68) * (100 / 60) * ((285 + 460) * 74.039 * 144) / (28.5 * 72.49 * 0.808 * 120 * 0.218 * 0.218) \\ \%I &= 100.3 \end{aligned}$$

Particulate Calculations

Grains per Cubic Foot, Dry Standard

$$\begin{aligned} Gr/DSCF &= (7,000 / 453,592) * (mg / Vm(std)) \\ Gr/DSCF &= (7,000 / 453,592) * (1.3 / 74.039) \\ Gr/DSCF &= 0.000271 \end{aligned}$$

Grains per Cubic Foot @ 12% CO₂, Dry Standard

$$\begin{aligned} Gr @ 12\% &= Gr/DSCF * (12 / \%CO_2) \\ Gr @ 12\% &= Gr/DSCF * (12 / 8.5) \\ Gr @ 12\% &= 0.000383 \end{aligned}$$

Grains per Cubic Foot @ 7% O₂, Dry Standard

$$\begin{aligned} Gr @ 7\% &= Gr/DSCF * (20.9 - O_2) / (20.9 - O_2) \\ Gr @ 7\% &= Gr/DSCF * (20.9 - 7) / (20.9 - 11.1) \\ Gr @ 7\% &= 0.000384 \end{aligned}$$

Pounds per Hour

$$\begin{aligned} Lb/hr &= 60 * (mg / 453,592) * (Qsd / Vm(std)) \\ Lb/hr &= 60 * (2.221 / 453,592) * (51390 / 74.039) \\ Lb/hr &= 0.119 \end{aligned}$$

Milligrams per Cubic Meter, Dry Standard

$$\begin{aligned} mg/DSCM &= mg / (Vm(std) * 0.02832) \\ mg/DSCM &= 1.3 / (74.039 * 0.02832) \\ mg/DSCM &= 0.620 \end{aligned}$$

Milligrams per Cubic Meter @ 7% O₂, Dry Standard

mg @ 7% = mg/DSCM * (20.9-7) / (20.9 – O₂)
mg @ 7% = mg/DSCM * (20.9-7) / (20.9 – 11.1)
mg @ 7% = 0.879

Mercury Calculations

Micrograms per Cubic Meter, Dry Standard

ug/DSCM = ug / (Vm(std) * 0.02832)
ug/DSCM = 2.221 / (74.039 * 0.02832)
ug/DSCM = 1.06

Micrograms per Cubic Meter @ 12% CO₂, Dry Standard

ug @ 12% = ug/DSCM * (12 / %CO₂)
ug @ 12% = ug/DSCM * (12 / 8.5)
ug @ 12% = 1.50

Micrograms per Cubic Meter @ 7% O₂, Dry Standard

ug @ 7% = ug/DSCM * (20.9-7) / (20.9 – O₂)
ug @ 7% = ug/DSCM * (20.9-7) / (20.9 – 11.1)
ug @ 7% = 1.50

Pounds per Hour

Lb/hr = 60 * (ug / 453,592) * (Qsd / Vm(std))
Lb/hr = 60 * (2.221 / (453,592*1000)) * (51390 / 74.039)
Lb/hr = 0.000204

HYDROGEN CHLORIDE EXAMPLE CALCULATIONS

TEST RUN 1-O-M26A-1

Volume Metered, Dry Standard Cubic Feet (STP)

$$\begin{aligned} V_{m(\text{std})} &= 17.64 * Y * V_m * (\bar{P} + \Delta H / 13.6) / (460 + t_m) \\ V_{m(\text{std})} &= 17.64 * 1.0192 * 38.33 * (29.6 + 1.31 / 13.6) / (460 + 82) \\ V_{m(\text{std})} &= 37.758 \end{aligned}$$

Volume of Water Collected, Dry Standard Cubic Feet (STP)

$$\begin{aligned} V_{w(\text{std})} &= 0.04707 * V_{lc} \\ V_{w(\text{std})} &= 0.04707 * 176.5 \\ V_{w(\text{std})} &= 8.308 \end{aligned}$$

Percent Moisture Content

$$\begin{aligned} \%H_2O &= 100 * V_{w(\text{std})} / (V_{w(\text{std})} + V_{m(\text{std})}) \\ \%H_2O &= 100 * 8.308 / (8.308 + 37.758) \\ \%H_2O &= 18.0 \end{aligned}$$

Mole Fraction of Flue Gas (Dry)

$$\begin{aligned} M_{fd} &= 1 - (\%H_2O / 100) \\ M_{fd} &= 1 - (18 / 100) \\ M_{fd} &= 0.820 \end{aligned}$$

Molecular Weight of Flue Gas (Dry)

$$\begin{aligned} M_d &= (%CO_2 * 0.44) + (%O_2 * 0.32) + ((%CO + %N_2) * 0.28) \\ M_d &= (8.5 * 0.44) + (11.1 * 0.32) + ((0 + 80.4) * 0.28) \\ M_d &= 29.8 \end{aligned}$$

Molecular Weight of Flue Gas (Wet)

$$\begin{aligned} M_s &= (M_d * M_{fd}) + (0.18 * \%H_2O) \\ M_s &= (29.8 * 0.82) + (0.18 * 18) \\ M_s &= 27.7 \end{aligned}$$

Flue Gas Absolute Pressure (" Hg)

$$\begin{aligned} P_s &= \bar{P} + (P_g / 13.6) \\ P_s &= 29.6 + (-14.5 / 13.6) \\ P_s &= 28.5 \end{aligned}$$

Flue Gas Velocity, Feet per Second. (Delta p avg is square of average square root)

$$\begin{aligned} v_s &= 85.49 * C_p * \text{SQRT} ((\Delta p_{\text{avg}} * (460 + t_s)) / (P_s * M_s)) \\ v_s &= 85.49 * 0.84 * \text{SQRT} ((1.112 * (460 + 286)) / (28.5 * 27.68)) \\ v_s &= 73.60 \end{aligned}$$

Volumetric Flowrate, Cubic Feet per Minute (STP), DSCFM

$$\begin{aligned}
 Q_{sd} &= 60 * Mfd * vs * A * (T_{std} / (ts + 460)) * (Ps / P_{std}) \\
 Q_{sd} &= 60 * 0.82 * 73.6 * 21.648 * (68 / (286 + 460)) * (28.5 / 29.92) \\
 Q_{sd} &= 52,897
 \end{aligned}$$

Volumetric Flowrate, Cubic Feet per Minute, (Actual), ACFM

$$\begin{aligned}
 Q_{aw} &= 60 * vs * A \\
 Q_{aw} &= 60 * 73.6 * 21.648 \\
 Q_{aw} &= 95,596
 \end{aligned}$$

Percent Isokinetic

$$\begin{aligned}
 \%I &= (P_{std} / T_{std}) * (100 / 60) * ((ts + 460) * Vm(std)) * 144 / (Ps * vs * Mfd * Theta * Nozzle area^2) \\
 \%I &= (29.92 / 68) * (100 / 60) * ((286 + 460) * 37.758 * 144) / (28.5 * 73.6 * 0.82 * 60 * 0.22 * 0.22) \\
 \%I &= 97.6
 \end{aligned}$$

Pounds per Hour

$$\begin{aligned}
 Lb/hr &= 60 * (mg / 453,592) * (Q_{sd} / Vm(std)) \\
 Lb/hr &= 60 * (1.72 / 453,592) * (52897 / 37.758) \\
 Lb/hr &= 0.319
 \end{aligned}$$

Parts per Million, Dry Volume

$$\begin{aligned}
 ppmd &= (385.3 E+06 * mg) / (453,592 * Mol. wt. * Vm(std)) \\
 ppmd &= (385.3 E+06 * 1.72) / (453,592 * 36.46 * 37.758) \\
 ppmd &= 1.06
 \end{aligned}$$

Parts per Million @ 12% CO₂, Dry Volume

$$\begin{aligned}
 ppmd @ 12\% &= ppm * (12 / \%CO_2) \\
 ppmd @ 12\% &= ppm * (12 / 8.5) \\
 ppmd @ 12\% &= 1.50
 \end{aligned}$$

Parts per Million @ 7% O₂, Dry Volume

$$\begin{aligned}
 ppmd @ 7\% &= ppm * (20.9-7) / (20.9 - O_2) \\
 ppmd @ 7\% &= ppm * (20.9-7) / (20.9 - 11.1) \\
 ppmd @ 7\% &= 1.51
 \end{aligned}$$

PM10 EXAMPLE CALCULATIONS
TEST RUN 1-O-M201A-2

Volume Metered, Dry Standard Cubic Feet (STP)

$$\begin{aligned} V_{m(\text{std})} &= 17.64 * Y * V_m * (\text{Pbar} + \Delta H / 13.6) / (460 + t_m) \\ V_{m(\text{std})} &= 17.64 * 1.0192 * 42.42 * (29.9 + 0.36 / 13.6) / (460 + 42.142) \\ V_{m(\text{std})} &= 42.359 \end{aligned}$$

Volume of Water Collected, Dry Standard Cubic Feet (STP)

$$\begin{aligned} V_{w(\text{std})} &= 0.04707 * V_{lc} \\ V_{w(\text{std})} &= 0.04707 * 195.5 \\ V_{w(\text{std})} &= 9.202 \end{aligned}$$

Percent Moisture Content

$$\begin{aligned} \%H_2O &= 100 * V_{w(\text{std})} / (V_{w(\text{std})} + V_{m(\text{std})}) \\ \%H_2O &= 100 * 9.202 / (9.202 + 42.359) \\ \%H_2O &= 17.8 \end{aligned}$$

Mole Fraction of Flue Gas (Dry)

$$\begin{aligned} M_{fd} &= 1 - (\%H_2O / 100) \\ M_{fd} &= 1 - (17.8 / 100) \\ M_{fd} &= 0.822 \end{aligned}$$

Molecular Weight of Flue Gas (Dry)

$$\begin{aligned} M_d &= (%CO_2 * 0.44) + (%O_2 * 0.32) + ((%CO + %N_2) * 0.28) \\ M_d &= (8.4 * 0.44) + (11.4 * 0.32) + ((0 + 80.2) * 0.28) \\ M_d &= 29.80 \end{aligned}$$

Molecular Weight of Flue Gas (Wet)

$$\begin{aligned} M_s &= (M_d * M_{fd}) + (0.18 * \%H_2O) \\ M_s &= (29.8 * 0.822) + (0.18 * 17.8) \\ M_s &= 27.70 \end{aligned}$$

Flue Gas Absolute Pressure (" Hg)

$$\begin{aligned} P_s &= \text{Pbar} + (P_g / 13.6) \\ P_s &= 29.9 + (-13 / 13.6) \\ P_s &= 28.9 \end{aligned}$$

Flue Gas Velocity, Feet per Second, (Delta p avg is square of average square root)

$$\begin{aligned} v_s &= 85.49 * C_p * \text{SQRT} ((\Delta p_{avg} * (460 + t_s)) / (P_s * M_s)) \\ v_s &= 85.49 * 0.84 * \text{SQRT} ((1.153 * (460 + 285)) / (28.9 * 27.7)) \\ v_s &= 65.32 \end{aligned}$$

Volumetric Flowrate, Cubic Feet per Minute (STP), DSCFM

$$\begin{aligned}
 Q_{sd} &= 60 * Mfd * vs * A * (Tstd / (ts + 460)) * (Ps / Pstd) \\
 Q_{sd} &= 60 * 0.822 * 65.32 * 21.648 * (68 / (285 + 460)) * (28.9 / 29.92) \\
 Q_{sd} &= 47,816
 \end{aligned}$$

Volumetric Flowrate, Cubic Feet per Minute, (Actual), ACFM

$$\begin{aligned}
 Q_{aw} &= 60 * vs * A \\
 Q_{aw} &= 60 * 65.32 * 21.648 \\
 Q_{aw} &= 84,846
 \end{aligned}$$

Percent Isokinetic

$$\begin{aligned}
 \%I &= (Pstd / Tstd) * (100 / 60) * ((ts + 460) * vm(std)) * 144 / (Ps * vs * Mfd * Theta * Nozzle area^2) \\
 \%I &= (29.92 / 68) * (100 / 60) * ((285 + 460) * 42.359 * 144) / (28.9 * 65.32 * 0.822 * 122.5 * 0.168 * 0.168) \\
 \%I &= 101.7
 \end{aligned}$$

Particle Cut Size

$$\begin{aligned}
 D_{50} &= 0.15625 * ((ts+460)/(Ms*Ps))^0.2091 * (viscosity/Cacf)^0.7091 \\
 D_{50} &= 0.15625 * ((285 + 460) / (27.7 * 28.9))^0.2091 * (214.6 / 0.614)^0.7091 \\
 D_{50} &= 9.79
 \end{aligned}$$

PM<10 Grains per Cubic Foot, Dry Standard

$$\begin{aligned}
 Gr/DSCF &= (7,000 / 453,592) * (PM<10mg / Vm(std)) \\
 Gr/DSCF &= (7,000 / 453,592) * (0.2 / 42.359) \\
 Gr/DSCF &= 0.0000729
 \end{aligned}$$

PM<10 Grains per Cubic Foot @ 12% CO2, Dry Standard

$$\begin{aligned}
 Gr @ 12\% &= Gr/DSCF * (12 / \%CO_2) \\
 Gr @ 12\% &= Gr/DSCF * (12 / 8.4) \\
 Gr @ 12\% &= 0.000104
 \end{aligned}$$

PM<10 Grains per Cubic Foot @ 12% CO2, Dry Standard

$$\begin{aligned}
 Gr @ 7\% &= Gr/DSCF * (20.9-7) / (20.9 - O_2) \\
 Gr @ 7\% &= Gr/DSCF * (20.9-7) / (20.9 - 11.4) \\
 Gr @ 7\% &= 0.000107
 \end{aligned}$$

PM<10 Pounds per Hour

$$\begin{aligned}
 Lb/hr &= 60 * (PM<10mg / 453,592) * (Qsd / Vm(std)) \\
 Lb/hr &= 60 * (0.2 / 453,592) * (47816 / 42.359) \\
 Lb/hr &= 0.0299
 \end{aligned}$$

PARTICULATE EXAMPLE CALCULATIONS TEST RUN 2-O-M23-1

Volume Metered, Dry Standard Cubic Feet (STP)

$$\begin{aligned} V_{m(\text{std})} &= 17.64 * Y * V_m * (\text{Pbar} + \Delta H / 13.6) / (460 + t_m) \\ V_{m(\text{std})} &= 17.64 * 1.0176 * 106.479 * (29.7 + 0.56 / 13.6) / (460 + 88) \\ V_{m(\text{std})} &= 103.771 \end{aligned}$$

Volume of Water Collected, Dry Standard Cubic Feet (STP)

$$\begin{aligned} V_{w(\text{std})} &= 0.04707 * V_{lc} \\ V_{w(\text{std})} &= 0.04707 * 459.5 \\ V_{w(\text{std})} &= 21.629 \end{aligned}$$

Percent Moisture Content

$$\begin{aligned} \%H_2O &= 100 * V_{w(\text{std})} / (V_{w(\text{std})} + V_{m(\text{std})}) \\ \%H_2O &= 100 * 21.629 / (21.629 + 103.771) \\ \%H_2O &= 17.2 \end{aligned}$$

Mole Fraction of Flue Gas (Dry)

$$\begin{aligned} M_{fd} &= 1 - (\%H_2O / 100) \\ M_{fd} &= 1 - (17.2 / 100) \\ M_{fd} &= 0.828 \end{aligned}$$

Molecular Weight of Flue Gas (Dry)

$$\begin{aligned} M_d &= (%CO_2 * 0.44) + (%O_2 * 0.32) + ((%CO + %N_2) * 0.28) \\ M_d &= (9.3 * 0.44) + (10.5 * 0.32) + ((0 + 80.2) * 0.28) \\ M_d &= 29.91 \end{aligned}$$

Molecular Weight of Flue Gas (Wet)

$$\begin{aligned} M_s &= (M_d * M_{fd}) + (0.18 * \%H_2O) \\ M_s &= (29.91 * 0.828) + (0.18 * 17.2) \\ M_s &= 27.85 \end{aligned}$$

Flue Gas Absolute Pressure (" Hg)

$$\begin{aligned} P_s &= \text{Pbar} + (P_g / 13.6) \\ P_s &= 29.7 + (-15 / 13.6) \\ P_s &= 28.6 \end{aligned}$$

Flue Gas Velocity, Feet per Second, (Delta p avg is square of average square root)

$$\begin{aligned} v_s &= 85.49 * C_p * \text{SQRT} ((\Delta p_{avg} * (460 + t_s)) / (P_s * M_s)) \\ v_s &= 85.49 * 0.84 * \text{SQRT} ((0.753 * (460 + 278)) / (28.6 * 27.85)) \\ v_s &= 59.98 \end{aligned}$$

Volumetric Flowrate, Cubic Feet per Minute (STP), DSCFM

$$\begin{aligned} Q_{sd} &= 60 * Mfd * vs * A * (Tstd / (ts + 460)) * (Ps / Pstd) \\ Q_{sd} &= 60 * 0.828 * 59.98 * 21.648 * (68 / (278 + 460)) * (28.6 / 29.92) \\ Q_{sd} &= 44,063 \end{aligned}$$

Volumetric Flowrate, Cubic Feet per Minute, (Actual), ACFM

$$\begin{aligned} Q_{aw} &= 60 * vs * A \\ Q_{aw} &= 60 * 59.98 * 21.648 \\ Q_{aw} &= 77,907 \end{aligned}$$

Percent Isokinetic

$$\begin{aligned} \%I &= (Pstd / Tstd) * (100 / 60) * ((ts + 460) * vm(std)) * 144 / (Ps * vs * Mfd * Theta * Nozzle area^2) \\ \%I &= (29.92 / 68) * (100 / 60) * ((278 + 460) * 103.771 * 144) / (28.6 * 59.98 * 0.828 * 240 * 0.197 * 0.197) \\ \%I &= 100.4 \end{aligned}$$

Concentration, ng/DSCM - Other TCDD

$$\begin{aligned} \text{ng/DSCM} &= (pg / 1000) / (0.02832 * Vm(std)) \\ \text{ng/DSCM} &= (32.2 / 1000) / (0.02832 * 103.771) \\ \text{ng/DSCM} &= 1.10E-02 \end{aligned}$$

Concentration, ng/DSCM @ 12% CO2 - Other TCDD

$$\begin{aligned} \text{ng @ 12\%} &= \text{ng/DSCM} * (12 / \%CO_2) \\ \text{ng @ 12\%} &= \text{ng/DSCM} * (12 / 9.3) \\ \text{ng @ 12\%} &= 1.41E-02 \end{aligned}$$

Concentration, ng/DSCM @ 7% O2 - Other TCDD

$$\begin{aligned} \text{ng @ 7\%} &= \text{ng/DSCM} * (20.9-7) / (20.9 - O_2) \\ \text{ng @ 7\%} &= \text{ng/DSCM} * (20.9-7) / (20.9 - 10.5) \\ \text{ng @ 7\%} &= 1.46E-02 \end{aligned}$$

Pounds per Hour - Other TCDD

$$\begin{aligned} \text{Lb/hr} &= 60 * (pg / 453,592) * (Qsd / Vm(std)) * 10E-09 \\ \text{Lb/hr} &= 60 * (32.2 / 453,592 / 10E9) * (44063 / 103.771) \\ \text{Lb/hr} &= 1.81E-09 \end{aligned}$$

Grams per Second - Other TCDD

$$\begin{aligned} \text{gms/sec} &= (\text{lb/hr} * 453.592) / 3600 \\ \text{gms/sec} &= (\text{lb/hr} * 453.592) / 3600 \\ \text{gms/sec} &= 2.28E-10 \end{aligned}$$

CONSTANTS, DEFINITIONS, & NOMENCLATURE

0.04707	Standard cubic feet per gram or milliliter of water @ standard conditions
0.18	Molecular weight of water divided by 100
0.28	Molecular weight of nitrogen divided by 100
0.32	Molecular weight of oxygen divided by 100
0.44	Molecular weight of carbon dioxide divided by 100
0.264	Ratio of O ₂ to N ₂ in air, v/v
0.5	Diatomeric factor
13.6	Specific gravity of mercury
17.64	Conversion factor, standard temperature, standard pressure, (degrees R, inches Hg)
20.9	Percent O ₂ by volume (dry basis) in ambient air
24	Hours per day
24.056	Molar volume liters per mole, STP
85.49	Pitot tube constant, ft./sec.
385.3	Molar volume, ft ³ /mole @ 68 deg. F, 29.92 inches Hg.
60	Minutes per hours, seconds per minute
100	Conversion to percent
460	0 degrees F in degrees R
7,000	Grains per pound
453,592	Milligrams per pound
A	Cross-sectional area of stack, square feet
avg	Average
CTavg	Calibration time, average
%CO ₂	Percent carbon dioxide, volume, dry basis
%CO + N ₂	Percent carbon monoxide and nitrogen, volume, dry basis
C _p	Pitot tube coefficient
Delta H	Average pressure differential of meterbox orifice, inches water
Delta pavg	Average pressure drop
DRE	Destruction and Removal Efficiency
%EA	Percent Excess Air
F	F-factor, dry standard cubic feet per million Btu
Gr/DSCF	Grains per dry standard cubic foot
7% O ₂	Concentration corrected to 7% oxygen
12% CO ₂	Concentration corrected to 12% carbon dioxide
gms/day	Grams per day
%H ₂ O	Percent moisture
Hg	Mercury
%I	Percent isokinetic sampling rate
Lb/hr	Emission rate, pounds per hour
Lb/MMBtu	Emission rate, pounds per million Btu heat input
Mfd	Mole fraction, dry
Md	Molecular weight of flue gas, dry
Ms	Molecular weight of flue gas, wet
mg	Milligrams
mg/DSCM	Milligrams per dry standard cubic meter
Nozzle area	Area of sampling nozzle, square feet
%O ₂	Percent oxygen
Pbar	Barometric pressure, inches Hg
Pg	Flue gas static pressure, inches H ₂ O
ppmd	Concentration, parts per million, dry, volume
Ps	Flue gas absolute pressure, inches Hg
Pstd	Standard absolute pressure at 29.92 inches Hg
Qsd	Volumetric flowrate, dry standard cubic feet per minute
Qaw	Volumetric flowrate, wet actual cubic feet per minute

CONSTANTS, DEFINITIONS, & NOMENCLATURE

(continued)

ta	Ambient temperature
Theta	Run time, minutes
tm	Dry gas meter temperature, degrees F, average of inlet and outlet meter temperatures
ts	Flue gas temperature, degrees F
Tstd	Standard absolute temperature, 528 Rankin
Vlc	Volume of liquid collected, mL
Vm	Volume of metered gas sample, dry, cubic feet
Vm(std)	Volume of metered gas sample, at standard conditions, dry cubic feet
vs	Average flue gas velocity, feet per second
Vsc	Milliliters sampled, dry, STP
Va	Milliliters sampled, actual, dry
Vw(std)	Volume of water vapor, stand cubic feet
Y	Gamma, dry gas meter calibration factor

CALCULATIONS

Volume Metered, Dry, (STP)

$$Vm(\text{std}) = 17.64 * Y * Vm * (P\bar{a} + \Delta H / 13.6) / (460 + t_m) \text{ ft}^3$$

$$V_{sc} = (17.64 * V_a * P\bar{a}) / (t_a + 460) \text{ Milliliters}$$

$$V_a = (\Theta * 60 * V_c * Y) / (CT_{avg} * 1000) \text{ Milliliters}$$

Volume of Water Collected, Dry Standard Cubic Feet (STP)

$$V_w(\text{std}) = 0.04707 * V_{lc}$$

Percent Moisture Content

$$\%H_2O = 100 * V_w(\text{std}) / (V_w(\text{std}) + V_m(\text{std}))$$

Mole Fraction of Flue Gas (Dry)

$$M_{fd} = 1 - (\%H_2O / 100)$$

Molecular Weight of Flue Gas (Dry)

$$M_d = (%CO_2 * 0.44) + (%O_2 * 0.32) + ((%CO + %N_2) * 0.28)$$

Molecular Weight of Flue Gas (Wet)

$$M_s = (M_d * M_{fd}) + (0.18 * \%H_2O)$$

Flue Gas Absolute Pressure (" Hg)

$$P_s = P\bar{a} + (P_g / 13.6)$$

Flue Gas Velocity, Feet per Second, (Delta p avg is square of average square root)

$$v_s = 85.49 * C_p * \text{SQRT} ((\Delta p_{avg} * (460 + t_s)) / (P_s * M_s))$$

Volumetric Flowrate, Cubic Feet per Minute (STP), DSCFM

$$Q_{sd} = 60 * M_{fd} * v_s * A * (T_{std} / (t_s + 460)) * (P_s / P_{std})$$

Volumetric Flowrate, Cubic Feet per Minute, (Actual), ACFM

$$Q_{aw} = 60 * vs * A$$

Percent Isokinetic

$$\%I = (P_{std} / T_{std}) * (100 / 60) * ((ts + 460) * \text{vm(std)}) / (Ps * vs * Mfd * Theta * Nozzle area)$$

Heat Input Rate, Million BTU per Hour

$$\text{MMBtu / hr} = 60 * (Qsd / F) * ((20.9 - \%O_2) / 20.9)$$

Percent Excess Air

$$\%EA = 100 * (\%O_2 - (0.5 * \%CO)) / ((0.264 - \%N_2) - (\%O_2 - (0.5 * \%CO)))$$

Grains per Cubic Foot, Dry Standard

$$\text{Gr / DSCF} = (7,000 / 453,592) * (\text{mg} / \text{Vm(std)})$$

$$\text{Gr/DSCF} = (7,000 * \text{ppmd} * \text{Mol. wt.}) / (385.3 E+06)$$

Pounds per Hour

$$\text{Lb/hr} = 60 * (\text{mg} / 453,592) * (Qsd / \text{Vm(std)})$$

$$\text{Lb/hr} = (60 * \text{ppmd} * \text{Mol. wt.} * \text{Qsd}) / (385.3 E+06)$$

Pounds per Million BTU

$$\text{Lb/MMBtu} = (\text{mg} / 453,592) * (F / \text{Vm(std)}) * (20.9 / (20.9 - \%O_2))$$

$$\text{Lb/MMBtu} = ((\text{ppmd} * \text{Mol. wt.}) / (385.3 E+06)) * F * (20.9 / (20.9 - \%O_2))$$

Parts per Million, Dry Volume

$$\text{ppmd} = (385.3 E+06 * \text{mg}) / (453,592 * \text{Mol. wt.} * \text{Vm(std)}) \quad \text{ft}^3$$

$$\text{ppmd} = 1,000,000 * (24.056 * \text{mg}/1000) / (\text{Vsc} * \text{Mol. Wt.}) \quad \text{milliliters}$$

$$\text{ppmd} = 1,000,000 * (24.056 * \text{ug}/1,000,000) / (\text{Vsc} * \text{Mol. Wt.}) \quad \text{milliliters}$$

Milligrams per Cubic Meter, Dry Standard

$$\text{mg/DSCM} = \text{ppmd} * (\text{Mol. wt.} / 24.056)$$

Grams per Day

$$\text{gms/day} = 24 * 60 * (\mu\text{g}/10^6) * \text{Qsd} / \text{Vm(std)}$$

Corrections

7% O₂ multiply by $(20.9 - 7) / (20.9 - \text{O}_2)$
12% CO₂ multiply by $(12 / \% \text{CO}_2)$

APPENDIX B
Field Data